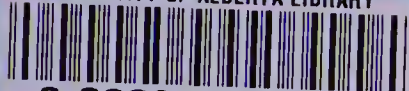


UNIVERSITY OF ALBERTA LIBRARY



0 0003 7673 688



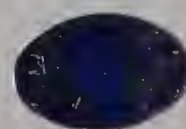
TEACHER'S EDITION
HOLT MATHEMATICS SYSTEM

BOOK 4



QA
107
H78
1980
bk. 4
tch. ed.
c. 5

CURR



Teacher's Edition
Holt
Mathematics
System
Book Four

*Author and General Editor of the Holt
Mathematics System*

Marshall P. Bye
Supervisor of Mathematics
Calgary Board of Education
Calgary, Alberta

Author

Ronald S. Sauer
Mathematics Consultant
Waterloo County Board of Education
Kitchener, Ontario

HOLT, RINEHART AND WINSTON OF CANADA, LIMITED
TORONTO

Authors

Marshall P. Bye

Supervisor of Mathematics
Calgary Board of Education
Calgary, Alberta

Ronald S. Sauer

Mathematics Consultant
Waterloo County Board of Education
Kitchener, Ontario

Reviewing Consultants

Douglas D. Farrar

Superintendent of Schools
Lambton County Board of Education
Sarnia, Ontario

Richard Holmes

Specialist in Mathematics
Calgary Board of Education
Calgary, Alberta

Heather J. Kelleher

Learning Assistant
John Robson Elementary School
New Westminster, B.C.

Ron Wittner

Vice-Principal
Henry Janzen School
Regina, Saskatchewan

Creative art by Bob Seguin.

Assembly and technical art by Frank Zsigo.

Teacher's Edition art by Maria Bergs.

Consulting Editor Rob Devine

Production Editor Sharon Dzubinsky

Canadian Cataloguing in Publication Data

Bye, Marshall P., 1928-

Holt mathematics system, book four
Teacher's ed.

Supplement to: Bye, Marshall P., 1928- Holt
mathematics system, book 4.
ISBN 0-03-920013-2

1. Mathematics — 1961- I. Sauer, Ronald S.,
1940- II. Title.

QA107.B9422 510 C81-094016-7

It is illegal to reproduce any portion of this book except
by special arrangement with the publishers.
Reproduction of this material by any duplication
process whatsoever is a violation of copyright. Special
permission has been granted for the duplication of the
Cumulative Test Item Bank.

Copyright © 1981 by
Holt, Rinehart and Winston
of Canada, Limited
Toronto

All Rights Reserved

ISBN 0-03-920013-2

Printed in Canada

UNIVERSITY LIBRARY
UNIVERSITY OF ALBERTA

TEACHER'S EDITION CONTENTS

Pupil Text Contents	iv
Scope and Sequence	v
Teacher's Commentary	xvi
Activity Reservoir	xx
Problems of the Week	xxvi
Cumulative Test Item Bank	xxix
Chapter 1 Overview and Commentary	xxxvi
Chapter 2 Overview and Commentary	32
Chapter 3 Overview and Commentary	60
Chapter 4 Overview and Commentary	100
Chapter 5 Overview and Commentary	128
Chapter 6 Overview and Commentary	160
Chapter 7 Overview and Commentary	184
Chapter 8 Overview and Commentary	212
Chapter 9 Overview and Commentary	244
Chapter 10 Overview and Commentary	280
Chapter 11 Overview and Commentary	304
Basic Skills Check Up	328
Extra Practice Exercises	329
Index	333

PUPIL TEXT CONTENTS

1	WHOLE NUMBERS Place Value • Addition and Subtraction	1
2	WHOLE NUMBERS 6-Digit Place Value • Addition and Subtraction • Measurement	32
3	MULTIPLICATION Estimating • Rounding	60
4	DIVISION	100
5	FRACTIONS AND DECIMALS Measurement • Money	128
6	APPLICATIONS: PROBLEM SOLVING AND MEASUREMENT	160
7	GEOMETRY AND PICTOGRAPHS Construction of 3D Shapes	184
8	ADDITION AND SUBTRACTION Place Value to Hundredths • Fractions and Decimals	212
9	COMPUTATION Multiplication and Division • Area and Volume	244
10	GRAPHS AND MEASUREMENT Bar and Line Graphs • Temperature • Time	280
11	GEOMETRY Congruence • Slides, Turns, and Flips	304
	Check Up—Chapters 1 to 5	328
	Check Up—Chapters 6 to 11	328
	Extra Practice—Chapters 1 to 11	329

SCOPE AND SEQUENCE

The following chart gives an overview of mathematical content presented at this grade level, the grade level below, and the grade level above. It shows the extent to which each mathematical topic is presented from grade

to grade in the HOLT MATHEMATICS SYSTEM. It is hoped that this will help you to better prepare your lessons for a successful teaching experience.

Grade 3

Number and Numeration

Word names for numbers (0-9999),
pp. 1, 5, 104-105

Place value

tens and ones, pp. 2-4

hundreds, pp. 41-42

thousands, pp. 101-107

Comparing numbers

using $>$, $<$ signs, pp. 6, 43,
106, 286

more, less, greater, fewer,
pp. 7, 29

fractions, p. 127

Ordinal numbers first through
twenty-sixth, p. 11

Skip counting

counting by twos, pp. 18, 158, 247
counting by threes, pp. 19,
158, 247

counting by fours, p. 164

counting by fives, pp. 167, 247

counting by tens and hundreds,
p. 247

Odd and even numbers, p. 20

Roman numerals to twelve, p. 32

Fractions

equal parts, p. 125

naming fractions, pp. 126, 128

comparing fractions ($>$, $<$),
p. 127

tenths, p. 129

parts of a set, p. 288

Decimals

tenths, pp. 130-131

ones and tenths, p. 132

Grade 4

Number and Numeration

Using digits to write numbers 0-9, p.1

Names of numbers 0-999 999,
pp. 16-17, 33-34, 39

Place value, expanded notation

ones and tens, pp. 2-3

3 digits, p. 16

4 digits, p. 33

5 digits, p. 34

6 digits, p. 39

tenths, p. 145

hundredths, pp. 214-219

Comparing numbers through 9999,
pp. 35-36, 230

decimals, p. 146

fractions, p. 13

Ordinals, first through
fifteenth, p. 4

Skip counting

by twos through tens, pp. 65-66

Equations, pp. 228, 230, 249

Inequations, p. 230

Odd and even numbers, p. 72

Roman numerals, I-C, pp. 56-57

Rounding

to nearest ten, p. 81

to nearest hundred, p. 92

to nearest thousand, p. 233

Estimating

using tens, pp. 84-85

using hundreds, p. 93

Grade 5

Number and Numeration

Whole Numbers

Average, pp. 284-286

Read and write numbers to:

thousands, p. 14

hundred thousands, p. 20

hundred millions, pp. 22-23, 25

billions, pp. 174-175

Comparing, p. 17

Equations, pp. 1-2, 165-175

Inequations, pp. 166, 168, 169

Exponents (10^1 - 10^4), p. 222

Place value to

thousands, p. 14

hundred thousands, p. 20

hundred millions, pp. 22-23, 25

billions, pp. 174-175

Prime numbers, pp. 150, 213-215

Sieve of Eratosthenes, p. 215

Composite numbers, pp. 213-215

Functions, pp. 184-185

History of math, pp. 114, 215

Properties of addition

commutative, p. 198

associative, p. 198

property of zero, p. 198

using properties, p. 199

Properties of multiplication

commutative, p. 200

associative, p. 200

property of 1, p. 200

property of 0, p. 200

using properties, p. 201

Properties of division

property of 0, p. 202

property of 1, p. 202

Grade 3

Number and Numeration *continued*

Zero

- in subtraction, pp. 74-75
- in addition, pp. 12-13
- in multiplication, p. 171

Grade 4

Number and Numeration *continued*

Fractions

- concept of fraction ($\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{10}$), pp. 129, 240
- equivalent fractions ($\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{10}$, $\frac{1}{100}$), pp. 130, 134
- comparing using $<$, $>$, $=$ ($\frac{1}{5}$, $\frac{1}{10}$), p. 131
- numerator, denominator, p. 129
- fractions as 1 ($\frac{3}{3}$, $\frac{5}{5}$, $\frac{8}{8}$, $\frac{9}{9}$, $\frac{10}{10}$, $\frac{100}{100}$), pp. 134, 214-215
- fractions greater than 1, p. 135
- hundredths as fraction, p. 214
- parts of a set, p. 241
- writing fractions as decimals, pp. 238-239

Decimals

- tenths, pp. 132-133
- ones and tenths, pp. 135, 140, 145
- hundredths, p. 215
- units-hundredths, pp. 216-217
- tens-hundredths, p. 218
- thousands-hundredths, p. 219
- comparing using $<$, $>$, $=$ (ones, tenths), p. 146
- comparing using money, p. 225
- comparing (10 000 through 0.01), p. 226
- rounding to nearest whole, p. 232
- rounding large decimal numbers, p. 233
- writing decimals for fraction numbers, $\frac{1}{2}$, $\frac{1}{5}$, pp. 238-239

Zero

- in addition, pp. 21-22
- in subtraction, pp. 27-29
- in multiplication, p. 64
- in division, p. 123

Grade 5

Number and Numeration *continued*

Distributive property, p. 203

Order of operations, pp. 280-283, 287

Expanded notation, p. 72
of measurement, p. 115

Divisibility rules (2, 3, 4, 5, 9, 10), pp. 206-209

Factors

- common, pp. 210, 212, 216
- greatest common, p. 217

Multiples

- common, pp. 218-220
- least common, p. 221

Fractions

Meaning

- numerator, denominator, pp. 229-230

Parts of a set, pp. 230-231

Comparing, p. 232

Adding and subtracting

- like fractions, pp. 233-234
- unlike fractions, pp. 246-248

Writing as decimal equivalents, pp. 235-236, 253

Equivalent fractions, p. 238

- writing, pp. 239-240
- checking, pp. 242-243
- lowest terms, p. 241

Mixed numerals, p. 244

- improper, proper, p. 244

Common denominator, p. 245

Least common denominator, pp. 249-250

Written as percents, p. 257

Relating fractions, decimals, percents, p. 258

Grade 3

Grade 4

Grade 5

Number and Numeration *continued*

Decimals

Place value

tenths, pp. 10, 13, 28

hundredths, pp. 10, 12-13, 28

thousandths, pp. 24-25, 28

Comparing, p. 17

Estimating to place decimal point,
p. 13

Fraction equivalents, pp. 235-236

Writing decimals for fractions,
p. 10

Rounding

to nearest one, p. 28

to nearest tenth, p. 28

to nearest hundredth, p. 28

money, pp. 64-65

Percent

concept, p. 254

percents, fractions, decimals,
pp. 257-258

percent of a number, p. 259

problems, pp. 260-261

Ratio

concept, p. 251

using, p. 252

equivalent, p. 255

Rounding

to nearest 1, 10, 100, 1000, p. 27

to nearest one, p. 28

to nearest tenth, p. 28

to nearest hundredth, p. 28

to nearest thousandth, p. 28

to estimate sum and difference,
p. 29

to estimate products, pp. 76, 87

to estimate quotients,
pp. 137-139

Roman numerals, pp. 30-31

Zero

in addition, p. 198

in subtraction, p. 198

in multiplication, p. 200

in division, p. 202

Predicting answers, p. 97

Grade 3

Addition

Basic addition facts

facts to nine, pp. 8-9

facts to eighteen, pp. 12-13, 15, 27, 38

Order property of addition, p. 10

Addends, sums, p. 15

Three addends, vertical column, pp. 30-31, 158

Adding, no regrouping

ones to tens and ones, pp. 17, 27, 33-34, 38

tens and ones, pp. 39-40

hundreds, tens, and ones, p. 44

Regrouping

tens and ones, pp. 45-46

hundreds, tens, and ones, p. 50

Adding with regrouping

tens and ones, pp. 47-49

hundreds, tens, and ones, pp. 48, 51-54, 76, 107-108, 143, 158, 247

Adding decimals

dollars and cents, p. 145

ones and tenths, pp. 133, 135

Zero in addition, pp. 12-13

Grade 4

Addition

Whole numbers

sums to 18, p. 5,

2 digits, no regrouping, p. 6

2 digits, regrouping, p. 7

3 addends, 1 digit in columns, p. 14

4 addends, p. 15

3 digits, no regrouping, p. 17

3 digits, regrouping, p. 19

3 and 4 digits, regrouping, p. 38

5 digits, regrouping, p. 39

6 digits, regrouping, p. 44

3 addends, 3 and 4 digits,

horizontal, p. 41

3 and 4 addends, 3 and 4 digits,

vertical, p. 231

relating addition and subtraction, p. 26

missing addends, p. 227

estimating sums, p. 234

Fractions

fractions with common

denominators, p. 236

Decimals

adding money, pp. 153-154, 156

tenths, no regrouping, pp. 139, 147

tenths, regrouping, p. 141

ones and tenths, regrouping, p. 148

hundredths, no regrouping, p. 220

addition with regrouping, p. 221

Properties

commutative property, p. 12

associative property, p. 13

Grade 5

Addition

Whole numbers

rounding, p. 29

2-digit addends, p. 7

3-digit addends, pp. 6-7

4-digit addends, p. 7

5-digit addends, p. 7

6-digit addends, p. 21

to billions, pp. 174-175

estimation in, pp. 268-269

practice, pp. 3, 9, 34, 265, 279

related to multiplication, p. 77

word problems, pp. 5, 8, 18-19, 26

Fractions

and decimals, p. 235

common denominators,

pp. 233-234

mixed numerals, p. 250

unlike fractions, pp. 245-249

Decimals

tenths, p. 11

hundredths, p. 12

thousandths, p. 16

and estimation, p. 13

money, pp. 12, 16

Properties

commutative, associative, of

zero, p. 198

use of, p. 199

Grade 3

Subtraction

Basic subtraction facts

- facts to nine, pp. 23, 27
- facts to eighteen, pp. 24, 55

Subtracting, no regrouping

- ones from tens and ones, pp. 25, 27, 33-34, 55-56
- tens and ones, p. 58
- hundreds, tens, and ones, pp. 65-66

Regrouping for subtraction

- tens and ones, p. 60

Subtraction with regrouping

- ones from tens and ones, p. 61
- tens and ones, pp. 62-63
- hundreds, tens, and ones, pp. 67-68, 70-71, 75-76, 143, 158, 247

Related sentences, addition and subtraction, p. 22

Subtracting decimals

- dollars and cents, p. 146
- ones and tenths, pp. 134-135

Zero in subtraction, p. 74

Grade 4

Subtraction

Whole numbers

- differences to 18, p. 5
- checking by adding, p. 26
- 2 digits, no regrouping, p. 21
- 2 digits, regrouping, p. 22
- 3 digits, no regrouping, p. 23
- 3 digits, regrouping, p. 24
- 4 digits, regrouping, p. 42
- 5 and 6 digits, regrouping, p. 43
- relating addition and subtraction, p. 26
- zeros in subtraction, regrouping, pp. 27-29
- estimating differences, p. 235

Fractions

- fractions with common denominators, p. 237

Decimals

- ones and tenths, no regrouping, p. 147
- ones and tenths, regrouping, pp. 143, 149
- hundredths, no regrouping, p. 222
- subtraction, regrouping, p. 223
- subtracting money, pp. 154-157

Grade 5

Subtraction

Whole numbers

- 6-digit minuends, p. 21
- and rounding, p. 29
- estimation in, pp. 268-269
- practice, pp. 3, 9, 34, 265, 278-279
- word problems, pp. 5, 18-19, 26

Fractions

- and decimals, p. 235
- common denominators, pp. 233-234
- unlike fractions, pp. 247-249
- mixed numerals, p. 250

Decimals

- tenths, p. 11
- hundredths, pp. 12, 14
- thousandths, p. 237
- money, p. 12

Properties

- commutative, associative, of zero, p. 198

Grade 3

Multiplication

Readiness for multiplication
relating addition and
multiplication, pp. 157, 159
meaning of multiplication, p. 217

Basic multiplication facts
multiplicands one through five,
pp. 160-163, 165-166, 168-171,
182, 184, 220-224, 232, 238, 265
multiplicands six through nine,
pp. 266-271, 278, 280, 285

Zero in multiplication, p. 171

Order property of
multiplication, p. 173

Multiplication by ten and one
hundred, pp. 225, 281-282

Associative property of
multiplication, p. 279

Grade 4

Multiplication

Relating addition and
multiplication, pp. 61-62

Relating multiplication and
division, pp. 102-103

Factors and products, 1 digit
 \times 1 digit, p. 63

Zero and one as factors, 1
digit \times 1 digit, p. 64

Multiples, pp. 65-66

Basic facts
up to 5×10 and 10×5 , p. 69
up to 10×10 , pp. 76-77

Commutative property, pp. 67-68,
73

Distributive property, pp. 74-75, 86

Associative property, p. 82

Multiplication by 1, 10, 100,
1000, pp. 79-80, 83, 254

Estimate product, pp. 84-85, 90,
93, 255

Partial products
no regrouping, p. 87
with regrouping, p. 88

Multiplication algorithm with
regrouping
 $2 \text{ digits} \times 1 \text{ digit}$, pp. 89, 94-95
 $3 \text{ digits} \times 1 \text{ digit}$, pp. 91, 124
 $2 \text{ digits} \times 2 \text{ digits}$, pp. 252-253,
265
 $3 \text{ digits} \times 2 \text{ digits}$, pp. 256-257

Missing factors, p. 246

3 factors, p. 273

Decimals, multiplication by 10,
p. 250

Grade 5

Multiplication

Relating multiplication and
addition, p. 77
division, pp. 108-109

Basic facts, p. 69

Factors
common, pp. 210-212, 216
greatest common, p. 217

Multiples
introduction, pp. 218-219
common, p. 220
least common, p. 221

Properties
commutative, associative,
pp. 200-201
of zero, of one, p. 201

Estimation of products, pp. 76, 87,
270-271

Practice, pp. 69, 88-89, 114, 197,
266, 278

Multiplication algorithm
of 2 digits by 1 digit, p. 73
of 2 digits by 2 digits, p. 85
of 3 digits by 1 digit, p. 74
of 3 digits by 2 digits, p. 86
of 3 digits by 3 digits, pp. 88-89
of 4, 5, 6 digits by 1 digit, p. 75
of multiples of 10 and 100, p. 84
by multiples of 10, 100, 1000,
p. 71
by 1, 10, 100, 1000, p. 70

Decimals
a decimal by a decimal,
pp. 94-95
a decimal by a whole number,
pp. 77-79, 82
a whole number by a decimal,
pp. 92-93

Word problems, pp. 80-81, 83,
90-91, 271

Grade 3

Division

Readiness for division
sharing, pp. 175, 217, 222
relating multiplication and
division, pp. 176, 218-219, 227,
240
repeated subtraction, p. 177

Quotient, p. 178

Basic division facts
divisors one through five, pp. 178,
181-182, 185, 227-232, 238
divisors six through nine,
pp. 272-276, 278, 285

Related sentences, multiplication
and division, pp. 179-180, 234-235

Introducing the $\overline{)}$ sign, p. 227

Dividing by ten, pp. 233, 283

Zero in division, p. 237

Using the multiplication table
for division, pp. 236, 284

Remainders in division,
pp. 290-291

Grade 4

Division

Meaning of division, p. 101

Related sentences (\times , \div),
pp. 102-103

Dividing 1- and 2-digit numbers,
by 2, 3, 4, 5, pp. 104-105
by 6, 7, p. 108
by 8, 9, p. 109

Division by 10, 100, 1000, p. 122

One in division, p. 106

Dividing by powers of ten, pp. 107,
254

Division with remainders
(problem form), pp. 112-114

Dividing powers of ten by
1-digit divisor, p. 115

Estimate quotient to nearest
10 using 3-digit divisor, p. 116

Dividing 3 digits by 1 digit,
no remainder, p. 117

Dividing 3 digits by 1 digit,
with remainders, pp. 119, 258-259

Checking division, no
remainder, p. 118

Short form
3 digits by 1 digit, pp. 120-121,
260
4 digits by 1 digit, pp. 261-262

Zero in division, p. 123

Finding average, pp. 164-165

Missing divisors and dividends,
p. 247

Rules for divisibility, 2-6, p. 264

Decimals, division by 10, p. 251

Grade 5

Division

Meaning of division, pp. 101, 103

Basic facts, pp. 102, 133

Division involving
1-digit divisor, 2-digit quotient,
pp. 104-105
1-digit divisor, 3-digit quotient,
p. 106
1-digit divisor, zero in quotient,
p. 142
2-digit divisor, 1-digit quotient,
pp. 136-137
2-digit divisor, 2-digit quotient,
pp. 139, 141
2-digit divisor, 3-digit quotient,
p. 141
2-digit divisor, zero in quotient,
p. 143
by 1, 10, 100, and 1000, p. 107
by multiples of 10, pp. 134-135
remainders, pp. 145-146

Related to
multiplication, p. 101
multiplication by 0.1, p. 108
multiplication by 0.01, p. 109

Estimating quotients, pp. 137-139

Zero in quotients, pp. 142-143

Checking
no remainders, p. 144
with remainders, pp. 146, 151

Properties, p. 202

Divisibility rules
(2, 3, 4, 5, 9, 10), pp. 206-209

Short division, pp. 272-273

With decimals, pp. 274-277

With money, pp. 275, 277

Practice, pp. 114, 133, 148-151,
197, 267

Word problems, pp. 103, 140

Grade 3

Geometry

Recognizing 3-D shapes, pp. 81-82, 85-87, 89, 92, 94
Sorting, pp. 96-97
Drawing shapes, pp. 86, 88-89, 93
Making 3D shapes, p. 84
Counting faces, p. 83
Classifying triangles, p. 87
Segments, rays, lines, p. 246
Angles, pp. 248-249
Similarity, p. 95
Symmetry, pp. 90-91, 93
Open and closed curves, p. 245
Circles, p. 93
Slides, pp. 250-251

Grade 4

Geometry

Recognizing and sorting solids, pp. 192, 197, 199
Rectangles, squares, p. 188
Skeletal models of cube, pyramid, and prism, p. 191
Solid models, pp. 185-186, 189-190, 194-195
Cross sections of solids, p. 200
Classifying solids, p. 198
Spheres, p. 196
Classifying triangles, p. 309
Line segments, p. 187
Intersecting and parallel lines, pp. 306-307
Segments, rays, angles, p. 308
Right angles, p. 193
Congruence, pp. 187, 310-311
Symmetry, p. 318
Circles, p. 305
Slides, pp. 312-313
Turns, pp. 314-316
Flips, p. 321

Grade 5

Geometry

Solids
edges, faces, vertices, p. 37
making and drawing cubes, p. 38
making and drawing rectangular prisms, p. 39
drawing cones and cylinders, p. 60
Angles
meaning, p. 41
naming, p. 41
measuring nonstandard unit, pp. 44-45
measuring standard degree, pp. 50-51
measuring using protractor, pp. 50-51
congruent, pp. 46-47
types, pp. 48-49
Circles
radius, diameter, pp. 42-43
Polygons
congruent, pp. 52, 54-57
names, classifying, p. 53
properties, p. 53
See slides, flips, turns.
Parallel lines, drawing, p. 58
Parallelograms, p. 59
Symmetry, pp. 297, 302
Flips
concept, pp. 297-298, 305
drawing, p. 299
using mirrors, pp. 300-301
completing flip patterns, pp. 304-305
matching corresponding parts, pp. 54-57, 299, 316
Segments, rays, lines, p. 41
Slides
congruence, p. 306
drawing, p. 307
matching corresponding parts, pp. 54-57, 306, 316
Rotations
rotational symmetry, pp. 308-309
congruence, pp. 306, 309-311
matching corresponding parts, pp. 54-57, 316
Making patterns, pp. 312-313
Enlargements, pp. 314-315
Tessellations
tiling, p. 317
Tangram, p. 61

Grade 3

Measurement

Time

1 min intervals, pp. 206-208
minute after, before, pp. 210-211
days, months, calendar, p. 203

Money

dollars and cents, pp. 144-148
making change, pp. 151-152
adding dollars and cents,
pp. 145, 247
subtracting dollars and cents,
pp. 146, 247

Heavier, lighter, pp. 121, 140

Metric

centimetre, metre, decimetre,
kilometre, pp. 37, 59, 69, 109,
111-113, 116, 189
litre, millilitre, pp. 137-138, 200
kilogram, gram, pp. 118-119, 201
changing metres to decimetres,
p. 113
using appropriate unit, p. 153

Temperature, p. 204

Rounding to nearest whole,
pp. 110-120

Estimation, pp. 114-115, 121, 201

Perimeter, pp. 190-191

Area, pp. 192-195

Volume, pp. 196-199

Grade 4

Measurement

Time

24 h clock, p. 298
seconds, hours, pp. 299-300
days, weeks, months, years, p. 300
decimal notation, p. 151

Money

making change to \$10, p. 152
adding dollars and cents,
pp. 153-154
subtracting dollars and cents,
p. 155

Metric

centimetre, metre, decimetre,
kilometre, millimetre, pp. 48-51,
136-138
millilitre, p. 174
kilogram, gram, p. 175
changing units within a measure,
pp. 52, 175
choosing a unit, pp. 54, 176, 266

Temperature, pp. 292-294

Rounding, p. 166

Estimation, pp. 47, 177, 272

Perimeter, p. 171

Area, pp. 267-272

nonstandard unit, p. 267
square centimetre, p. 268
area of rectangle, p. 269
square metre, p. 271
estimating area, p. 272

Volume

nonstandard units, p. 274
cubic centimetre, p. 276
cubic metre, p. 277
calculating, p. 275

Grade 5

Measurement

Time

minutes, hours, days, weeks,
years, p. 126

Time zones of Canada, p. 127

Money, p. 12

Linear, pp. 110-113

Mass, pp. 121-123

Capacity, p. 119

Converting

centimetre, metre, p. 110
centimetre, metre, decimetre,
pp. 111-112
kilometre, hectometre, metre,
p. 113
litre, millilitre, p. 119
kilogram, gram, pp. 120-121
kilogram, tonne, pp. 122-123

Estimating lengths, p. 129

Expanded notation of units, p. 115

Temperature, pp. 124-125

History, p. 114

Scale measurement, pp. 117,
153-154

Energy, kilojoules, p. 84

Perimeter, pp. 116, 152

Radius and diameter of circle,
p. 43

Area, pp. 153-154

rectangles, p. 155
right triangles, pp. 156-157

Volume

nonstandard unit, p. 159
standard units, pp. 160-161
rectangular prism, pp. 160-161

Grade 3

Problem Solving

Using addition to interpret a pictured problem, p. 8

Using subtraction to interpret a pictured problem, p. 21

Using fractions and decimals to interpret a pictured problem, p. 136

Word problems, addition, pp. 14, 16, 31, 49, 77, 108

Word problems, subtraction, pp. 26, 28-29, 57, 64, 77

Problems involving measurement, pp. 69, 117, 139, 141, 252

Problems with extraneous information, p. 142

Problems involving money, pp. 147, 149-150, 252, 261

Problems involving time, pp. 212-213

Word problems, multiplication, pp. 174, 183, 205, 226, 239, 241, 287, 289

Word problems, division, pp. 183, 205, 222, 239, 241, 277, 287, 289

Choosing a number sentence to fit a problem, p. 202

Writing a number sentence to fit a problem, p. 209

Interpreting information in a chart or graph, pp. 253-261

Grade 4

Problem Solving

How to read math problems, pp. 8, 10-11

Addition and subtraction
whole numbers, pp. 11, 25, 40, 45, 53-54
decimals, pp. 228, 235

Multiplication and division
whole numbers, pp. 70-71, 90, 97, 107, 111-112, 122, 162-163, 248-249, 263

Time and distance, p. 170

Capacity, p. 173

Temperature, p. 295

Area and volume, pp. 270-271, 296

Money, change, p. 152
addition and subtraction, pp. 156-157

Time line, p. 301

Drawing pictures to solve problems, p. 179

Two-step problems, pp. 180-181

Solving from a paragraph, p. 178

Estimating to solve, pp. 84-85, 90, 93

Writing number sentences, pp. 53, 228, 249

Writing problems to fit number sentences, p. 229

Using charts, problems with many questions, pp. 178, 201

Too little information, p. 172

Interpreting charts, graphs, pp. 281-292

Grade 5

Problem Solving

Addition and subtraction, pp. 4, 5, 8, 18-19, 26, 34

Multiplication, pp. 80-81, 83-84, 90-91, 271

Division, pp. 140, 274-277, 284-286

Mixed operations, pp. 91, 103, 118, 147, 183, 204, 256, 260-261, 269, 303, 318

Measurement
linear, pp. 117-118
mass, pp. 120-123
temperature, pp. 124-125
time, p. 126
time zones, p. 127
area, p. 158
volume, p. 161
mixed, pp. 128, 147
money, pp. 26, 62, 64, 225

Drawing pictures, p. 63

Multiple step, pp. 19, 40, 62

Average, p. 285

Restating problems, p. 96

Mini-problems, p. 140

Making up problems, p. 205

Estimating, pp. 13, 269, 271

Approximations (rounding), pp. 64-65

Writing number sentences, pp. 283, 287

Equations, pp. 170-175

Large numbers, pp. 174-175

Using data in charts, pp. 124-127

Consumer applications, pp. 224-225

Using scale drawings, p. 117

Ratios, p. 256

Percent, pp. 260-261

Grade 3

Graphing

Tally marks, pp. 254-255
Picture graph, pp. 256-257
Bar graph, pp. 258-260, 265
Schedules, p. 213

Careers

Conservation officer, p. 29
Post office clerk, p. 49
Baker, p. 64
Flower shop clerk, p. 77
Grocery store clerk, p. 92
Carpenter, p. 117
Coffee shop worker, p. 136
Fruit farmer, p. 141
Animal trainer, p. 183
Pet shop clerk, p. 205
Factory workers, p. 241
Carnival workers, p. 261
Doctor, p. 289

Grade 4

Graphing

Tally charts, p. 206
Pictographs, pp. 204-209
Bar graphs, pp. 281-289
Reading charts, pp. 201-202
Line graph, pp. 290-291
Reading a city map, pp. 322-323
Using a map, pp. 51, 168-169
Ordered pairs, pp. 322-325
Scale drawing, pp. 167-169

Careers

Flight attendant, p. 25
Manufacturing plant worker,
p. 54
Sports shop owner, p. 97
Grocery store clerk, p. 111
Hamburger stand operator,
p. 157
Gas station owner, p. 163
Post office worker, p. 209
Engineer, p. 235
Construction worker, p. 256
Librarian, p. 301
City designer, p. 322

Grade 5

Graphing

Numbers on a number line, p. 167
Solutions on a number line of
equations and inequations,
pp. 168-169
Pictographs, pp. 176-177,
290-291
Bar graphs, pp. 178-179
Broken line, pp. 180-181,
292-293
Circle graph, pp. 261, 288-289
Time-distance graph, pp. 186-187
Coordinate plane
ordered pairs, p. 188
locating ordered pairs on grid,
p. 189
vertical, horizontal, p. 190
locating points on grid, p. 191
locating points on a map,
pp. 192-193
Functions (ordered pairs),
pp. 184-185

Careers

Pharmacist, p. 26
Concession operator, p. 62
Dockyard worker, pp. 90-91
Service station operator, p. 103
Fishing guide, p. 118
Physicist, p. 147
Car rental manager, p. 183
Industrial designer, p. 204
Librarian, p. 256
Building contractor, pp. 260-261
Fisherman, p. 269
Flooring contractor, p. 303
Physical therapist, p. 318

TEACHER'S COMMENTARY

THE HOLT MATHEMATICS SYSTEM

Two fundamental premises which underlie an effective learning system are:

1. Motivation is an important prerequisite to learning.
2. Each student may require a different motivational technique.

The HOLT MATHEMATICS SYSTEM (HMS) was developed to incorporate these premises. The various components of HMS provide a variety of motivational and instructional devices with which to reach students.

Teachers can present opportunities for learning through a medium best suited to the particular abilities and learning style of the individual student. The components of HMS are:

Readiness

Student's Book
Teacher's Edition

Grade 1

Student's Book
Teacher's Edition
BFA Computational Skills Kit I

Grade 2

Student's Book
Teacher's Edition
BFA Computational Skills Kit I
BFA Math Problem Solving I

Grade 3

Student's Book
Teacher's Edition
BFA Computational Skills Kit I
BFA Math Problem Solving I
Duplicating Masters

Grade 4

Student's Book
Teacher's Edition
BFA Computational Skills Kit II
BFA Math Problem Solving II
Duplicating Masters
Calculator Workbook

Grade 5

Student's Book
Teacher's Edition
BFA Computational Skills Kit II
BFA Math Problem Solving II
Duplicating Masters
Calculator Workbook

Grade 6

Student's Book
Teacher's Edition
BFA Computational Skills Kit II
BFA Math Problem Solving II
Duplicating Masters
Calculator Workbook

TEACHING STRATEGIES

There is no one best way to teach mathematics to all students. Therefore, the HOLT MATHEMATICS SYSTEM is adaptable to many teaching styles.

Four different ways in which the program can be taught are:

- Teach the whole class together; have all students work on the same material at the same time, with the same written assignments.
- Teach the whole class together; have all students work on the same material at the same time, but differentiate the written assignments.
- Group the children and teach each group separately; each group may be doing different lessons on the same day.
- Use a continuous progress approach, letting each student progress at his or her own rate; every student could be working on a different lesson on any particular day. Suggestions in the *Teacher's Edition* provide assistance in differentiating the assignments.

THE STUDENT'S BOOK

Language

While it is important to teach students to become better readers, even within the framework of mathematics instruction, a deficiency in reading should not stand in the way of learning mathematics. The language used in the *Student's books* is uncomplicated and concepts are presented by means of illustrations or examples rather than by long verbal explanations.

Clear, concise titles, which appear at the top of every lesson, serve as a general description of content. A further note outlining the specific page object and subject matter is included at the bottom of every page.

Content

The major primary grade concepts which appear throughout HMS are as follows:

Number and Numeration
Operations and Properties
Sentences
Problem Solving and Application
Geometry
Measurement
Graphs, Tables

Since students do not fully master any concept on the first encounter, this program of studies is presented in three stages:

- 1st — a thorough introduction
- 2nd — reinforcement and mastery
- 3rd — maintenance and extension.

Understanding is consistently reinforced as students bring their growing knowledge and maturity to bear upon more abstract concepts and more difficult skills.

Developmental Aspects of Lessons

The HOLT MATHEMATICS SYSTEM is “developmental” in that each lesson is sequenced to proceed from an initial activity, through a learning stage, and finally to practice exercises. This lesson style (**display**, **development**, and **drill**) was adopted to give children an understanding of the concepts in the lessons through active participation in the development of the concepts or skills, followed by practice in the use of these concepts.

Each lesson follows a definite pattern: (1) **display** — an *initial activity* where hands-on materials such as blocks are used to teach the concept; the initial activity appears in the side column of the *Teacher's Edition* for every lesson. (2) **development** — a *learning stage* which uses pictures and other visual hints to develop the concept; the learning stage is the first part of the Exercises where the child is guided, through the use of coloured numerals or other hints, to the pattern of response. To provide immediate reinforcement, the answer to some of the developmental items, indicated by circles, are placed in the back of the *Student's book*. (3) **drill** — *exercises* which drill the concept or skill presented in the display; the exercises are the items which the children do individually to demonstrate understanding.

Basic Skills

HMS embodies the philosophy that it is important for the student to develop a concept or skill meaningfully. However, a meaningful development needs to be followed by practice. To become a proficient user of mathematics one has to practise the skills that have been acquired. Accordingly, ample practice is provided to diagnose areas of difficulty and to maintain skills.

Throughout the program, a large number of computational exercises are presented with over 4000 in each book, Grades 2 to 6. Additional exercises may be found in the other HMS components.

Exercises which extend the developmental items presented in the lesson are starred. Additional challenges are provided by the **Braintickers** which appear throughout the book.

HMS repeatedly asks students to discover patterns. These experiences are intended to help build a sense of relationship between numbers and to develop self-reliance when a problem is tackled. Discovering patterns is an enjoyable activity since it is usually accompanied by a sense of anticipation.

Diagnosing

Diagnostic materials appear throughout HMS in a variety of formats. The **Basic Skills Check Ups**, which are part of HMS from Readiness to Grade 6, provide experience in the type of format that is often used on standardized tests.

Cumulative Reviews in Grades 3 to 6 enable the teacher to pinpoint areas of the child's achievement or deficiency prior to studying other concepts in the text. Based on the results, one can determine what combination of learning experiences will best help each child.

All **Check Ups** and **Cumulative Reviews** are keyed in the *Teacher's Edition* to the pages on which the skills were presented.

The **Chapter Test** at the end of each chapter can also be used diagnostically. Each exercise in the test is referenced in the *Teacher's Edition* to a specific objective and page number. This provision enables the teacher to review specific concepts and skills needing improvement.

A **Cumulative Test Item Bank**, located at the front of each *Teacher's Edition* (Grades 1 to 6), covers a representative sampling of the entire year's objectives. There are two matching items per objective in the Grades 3 to 6 tests, thereby offering the opportunity for repeat testing. The **Cumulative Test** for Grades 1 and 2 is presented in a multiple-choice type format.

Maintaining Skills

Keeping acquired skills sharp is important to HMS. Maintenance pages therefore appear regularly throughout the pupil books. **Keeping Fit** (Grades 1 and 2) and **Tune Up** (Grades 3 to 6) are mixed frequently with stimulating **Practice** pages to help reinforce specific facts and concepts.

At the end of each book are collected additional **Extra Practice** exercises, keyed to the appropriate pages in the *Student's book*.

Additional and supplementary practice material in the form of duplicating masters, computational and problem solving skills kits, and a calculator workbook are also available and are keyed to the program.

Testing

A complete testing program for monitoring students' progress is provided within HMS. **Chapter Tests** (called “Think” in Grades 1 and 2) at the end of each chapter are designed to help evaluate the extent of mastery of the essential chapter content. In the *Teacher's Edition*, test items are referenced to pupil page numbers and specific objectives which are listed for each chapter. An invaluable measuring device, the **Chapter Tests** allow teachers to diagnose the particular strengths and weaknesses of each student.

Additional test materials and supplementary tests are available in the form of *duplicating masters* (Grades 3 to 6).

Measurement

The measurement section in HMS is completely SI metric. The strand features a “hands-on” approach to measurement augmented by written exercises which further broaden and reinforce the concepts.

Often a page of nonstandard, informal units of measure will help introduce the activities and exercises developing the established measurement system.

Problem Solving

Solving problems is one of the major strands in HMS. We start problem solving early and use it as a tool for reinforcing basic facts.

The development of problem-solving skills is very gradual. It is based essentially on (1) interpreting action pictures, (2) joining and separating sets of objects, and (3) solving word problems without pictures. Word problems are first presented in the form of mini-problems which contain a picture dictionary to help children read the printed words. Mini-problems contain only those words which are necessary for an understanding of the problems.

From these careful beginnings, problem solving in HMS is expanded to include:

- reading word problems
- choosing a number sentence to fit a word problem
- writing number sentences
- estimating the answer
- recognizing extraneous and insufficient information
- reading information from tables or graphs
- choosing the correct operation
- solving word problems related to careers
- multiple-step problems
- drawing pictures to help solve problems
- establishing and using a problem-solving technique

to mention a few.

The challenge of providing children with an opportunity to grow systematically in the ability to solve problems is met by incorporating word problems into many of the lessons throughout the program.

In addition to this rich and systematic program of developing problem-solving skills, HMS includes a lesson on problem solving related to a selected career in each chapter. This career strand is of considerable importance to this program and is therefore discussed in detail.

Career Strand

Making children aware of existing careers makes mathematics learning relevant, realistic, and motivational.

Specifically, the purpose of the HMS career strand is twofold:

- To stimulate career awareness in children by presenting them with problems which deal with situations related to various careers, and
- To provide teachers with the essential information about various careers.

Appropriate learning experiences or activities are provided in the *Teacher's Edition* for lessons dealing with careers. These lessons are adapted to the developmental level of the child.

The careers are chosen to focus on certain specific objectives:

- To help the child develop an awareness of physical skills
- To develop an awareness of self and others
- To help students develop self-reliance
- To develop an awareness of a multitude of careers
- To develop social awareness

Each chapter highlights one or more specific careers and provides the opportunity to discuss others.

Activity Pages

Interspersed throughout the texts are **activity** pages.

Activity pages provide motivation and active participation on the part of the child. Concepts are developed or practised through the use of activities.

Chapter Themes

In an effort to motivate children and to interrelate mathematics to other subject areas, some chapters in these books are oriented toward certain themes. For example, the theme of a chapter may pertain exclusively to transportation, fairy tales, the sea, the farm, the community, the circus, foreign lands, and others. The illustrations in these chapters emphasize the theme of the chapter. These themes are identified in the **Chapter Overviews**.

THE TEACHER'S EDITION

The *Teacher's Edition* is the key to using HMS. All references to components of this program, as they apply to each lesson, are provided literally at one's fingertips. With this type of manual, the teacher can easily direct children to other practice materials, guide them to activities, and provide them with projects that will extend their mathematical horizons.

The layout for each individual lesson contains a reduced version of the pupil page with answers superimposed. Surrounding this are the related lesson commentaries closely positioned to allow quick and easy access.

Front of Teacher's Edition

A **Scope and Sequence** chart displays three years of topics and the extent to which they are presented in HMS. Using the chart, it is easy to tell, at a glance, where any particular lesson falls in the flow and scheme of the whole Mathematics System.

An **Activity Reservoir** section, consisting of mathematical games and activities, provides a framework for enjoyable practice work throughout the year. These games and activities are keyed into individual lessons, but each may be adapted and used at the discretion of the teacher.

A **Problem of the Week** section consists of challenging mathematical puzzles and problems. These are for additional motivation. They can be offered to children via the bulletin board or a special problem box.

A **Cumulative Test Item Bank** is supplied for the evaluation of the children's achievement with respect to part or all of the entire year's work. Pupil edition page references which are located along the margins of this section, allow the teacher to select items which test the appropriate desired objective. This format also allows the teacher to test on a regular basis or periodically spot check, as the particular situation may require.

Chapter Overview

Chapter Overviews are appropriately interleaved before each chapter. Each overview consists of the following parts:

An **Introduction** explains what content is to be studied in the chapter.

Objectives for the chapter are stated in behavioural terms.

Background provides a meaningful setting for the mathematical concepts and skills taught in the chapter.

Materials lists the materials that are suggested for use in teaching the lessons.

Career Awareness describes the career to be studied in that chapter and provides background information for discussion. When necessary a caption is given for the photograph illustrating the career (Grades 1 and 2).

Lesson Commentaries

Daily lesson commentaries generally provide varied approaches to teaching the lessons. Each lesson commentary, in the side columns of the *Teacher's Edition*, contains the following categories:

Objectives for each lesson are stated in behavioural terms. These objectives state very specifically what a child ought to be able to do at the end of the lesson.

Pacing suggestions are provided for some lessons to indicate how assignments may be differentiated.

Level A: a minimum course

Level B: an average course

Level C: an extended course

Vocabulary lists new words and terms introduced in the lesson.

Materials lists teaching aids helpful for teaching the lesson.

Related Aids keys the appropriate supplementary components of the program to the particular lesson.

Background provides a meaningful setting for mathematical concepts on which the lesson is based.

Suggestions usually provide readiness-type learning experiences which encourage children's involvement. This section contains the **Initial Activity** comments that may be completed before using the pupil page.

Using the Book provides specific teaching instructions for the lesson.

Activities provide varied learning experiences such as mathematical games, research projects, experiments, and so on that represent additional practice, enrichment, or extension. The activities are usually listed in order of difficulty.

Extra Practice supplies additional exercises which are appropriate to the content of the particular page. The assignment of these **Extra Practice** exercises, whether they be used orally as review preceding the next page, placed on cards or chalkboards as remedial exercises or perhaps for fast finishers, is of course left up to the discretion of the teacher.

SUPPLEMENTARY MATERIALS

Duplicating Masters provide extra practice for selected lessons, graph paper, dot paper, cutouts for activities, nets for geometry and additional chapter tests.

BFA Computational Skills Kits I (Grades 1 to 3) and *II* (Grades 4 to 6) provide a diagnostic/prescriptive program for both instruction and practice. Simple placement tests help identify each child's level.

BFA Math Problem Solving I and *II* offer instruction and practice in solving math story problems. The kits are organized into five sections: Addition/Subtraction; Multiplication/Division; Application; Review; Enrichment.

Calculator Workbook provides an opportunity to use the calculator to explore topics formerly thought to be too difficult and tedious. The exercises are related directly to the concepts developed in the *HMS Student's book*. Emphasis is on generalizing concepts, using larger numbers, and extension of concepts.

ACTIVITY RESERVOIR

PICKING PEACHES

Use: To practise computation

To practise quick checking of computations for possible errors

Materials: 60 cards in four colours (15 per colour) examples of which (for multiplication without regrouping) are shown. The twist is that only some (40 to 45) are correct (i.e., "Peaches"). The rest of the cards show some error in computation.

$$\begin{array}{r} 33 \\ \times 2 \\ \hline 6 \\ 60 \\ \hline 66 \end{array}$$

Blue

$$\begin{array}{r} 43 \\ \times 2 \\ \hline 5 \\ 80 \\ \hline 85 \end{array}$$

Red

$$\begin{array}{r} 51 \\ \times 4 \\ \hline 4 \\ 200 \\ \hline 240 \end{array}$$

Green

$$\begin{array}{r} 62 \\ \times 3 \\ \hline 6 \\ 180 \\ \hline 186 \end{array}$$

Black

Players: Two to five

The Game: Deal 7 cards per player. Players take turns exchanging a card in their hand for the top card from either the deck (face down) or the discard pile (face up). The winner is the first player to assemble a hand of cards that are (a) all the same colour and (b) "Peaches" (i.e., correct).

DEAL A NUMBER SENTENCE

Use: To practise basic facts, computational skills, mathematical relations, and order of operations

Materials: Deck of conventional playing cards with face cards removed (or a deck of cards with four of each number 1 to 10) and a sufficient number of symbol cards (+, -, ×, ÷, =) to accommodate the number of players

Players: Two or more

The Game: Six number cards are dealt to each player. The object is to make a number sentence using as many cards as possible. Score 1 point for each number card used. (The symbol cards may be taken as needed.) Winner is the player with the most points after a pre-determined number of rounds.

$$6 + 5 + 4 = 5 \times 3 \quad (5 \text{ points})$$

Variations: 1. Deal more cards.

2. Use inequality signs. $<$ $>$

3. Reinforce order of operations by including parenthesis cards. $()$

4. Assign values to symbol cards (i.e., one point for each symbol card, or two for addition, three for multiplication, etc.)

5. Assign values to number cards equal to the numeral which appears on them (in the example shown, score 23).

DOMINOES

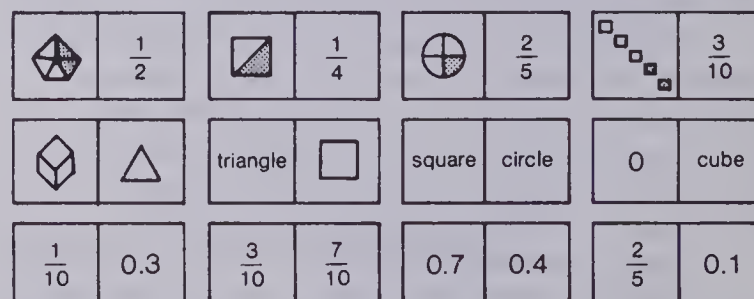
Use: To practise basic facts and recognition, renaming, and matching skills

Materials: At least 20 dominoes made from light cardboard

Players: Two or more

The Game: Prepare a set of domino cards with appropriate notation. The ends of each card must match the end of some other card in the deck. To begin, each player is given 4 dominoes. The remaining cards are left face down on a desk between the players. One of these "middle cards" is turned face up and serves as the starting point. The players take turns matching a domino in hand with one that has been played. If a play cannot be made, that player must draw another domino from the middle set. The object of the game is to be the first to play all dominoes held in hand.

Sample cards are shown below.

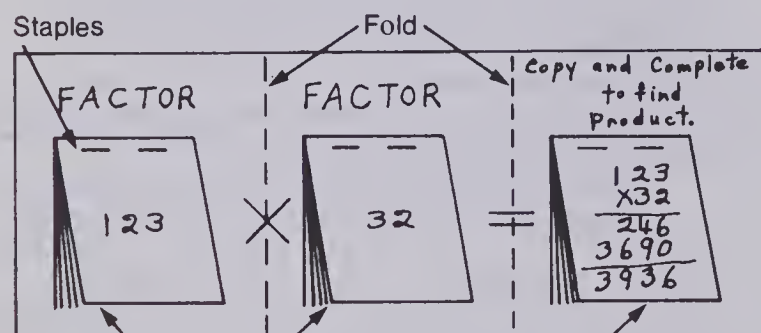


Variation: Deal all dominoes equally among the players. All players display their own run-on domino sentences. The winner is the player who used the most dominoes in his/her display.

THE FACT FOLDER

Use: To practise computation

Materials: Make a booklet similar to the one illustrated. Use different colours of construction paper for each booklet.



Several pages with different numbers on each page stapled to a stiff larger sheet.

Several blank pages upon which answers may be calculated.

Players: One

The Game: A student carries out the computation. Encourage periodic checking with the use of a calculator. Similar folders or one "modifiable" folder can be used for the other three operations.

CONCENTRATION

Use: To practise basic facts and recognition, renaming, and matching skills

Materials: Index cards

Players: From two to four

The Game: Prepare 10 to 15 matching pairs (20 to 30 cards in all) of appropriate facts cards. Shuffle the cards and place them face down on a desk in a regular array. To begin, the first player turns over a card and names the figure (or word) which appears. The same player then turns over and names a second card. If the two cards match, that player scores one point, removes these cards from the array, and takes another turn. If they do not match, both cards are turned face down and the next player proceeds. Students must "concentrate" to recognize and remember the various card locations. The player with the most points after all cards have been paired is the winner.

Some sample card pairs:

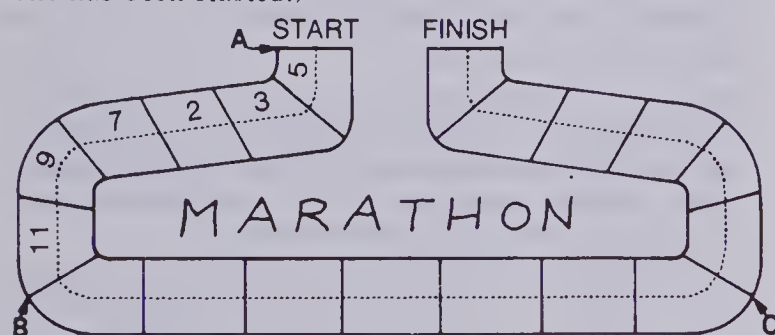
3×6	$9 + 9$	$\frac{3}{100}$	0.03
3×100	300	10 cm	1 dm

Variation: For added challenge, add a third card to each set to play "triple concentration". Triple sets are easy to make for: equivalent fractions; fractions, decimals, fraction grids; measurement unit relationships (i.e., 2 m, 200 cm, 2000 mm); number expressions (i.e., 15, 5×3 , $10 + 5$) or (9, IX, 3×3); characteristics of shapes (no flat faces, sphere, no corners).

MARATHON

Use: To practise computational skills
To develop speed and accuracy

Materials: A blank "race track" for each player. (This one has been started.)



Players: Any number

The Game: Direct the players to write numbers in the spaces provided on their race tracks. Either allow them to randomly choose numbers from a predetermined set or have them write numbers as they are dictated. Choose numbers suitable for the skill to be practised. Identify the instruction for the race such as "Multiply by 3". Record the start time and signal "Go!" Players fill in the appropriate answers. Record the time that each player finishes.

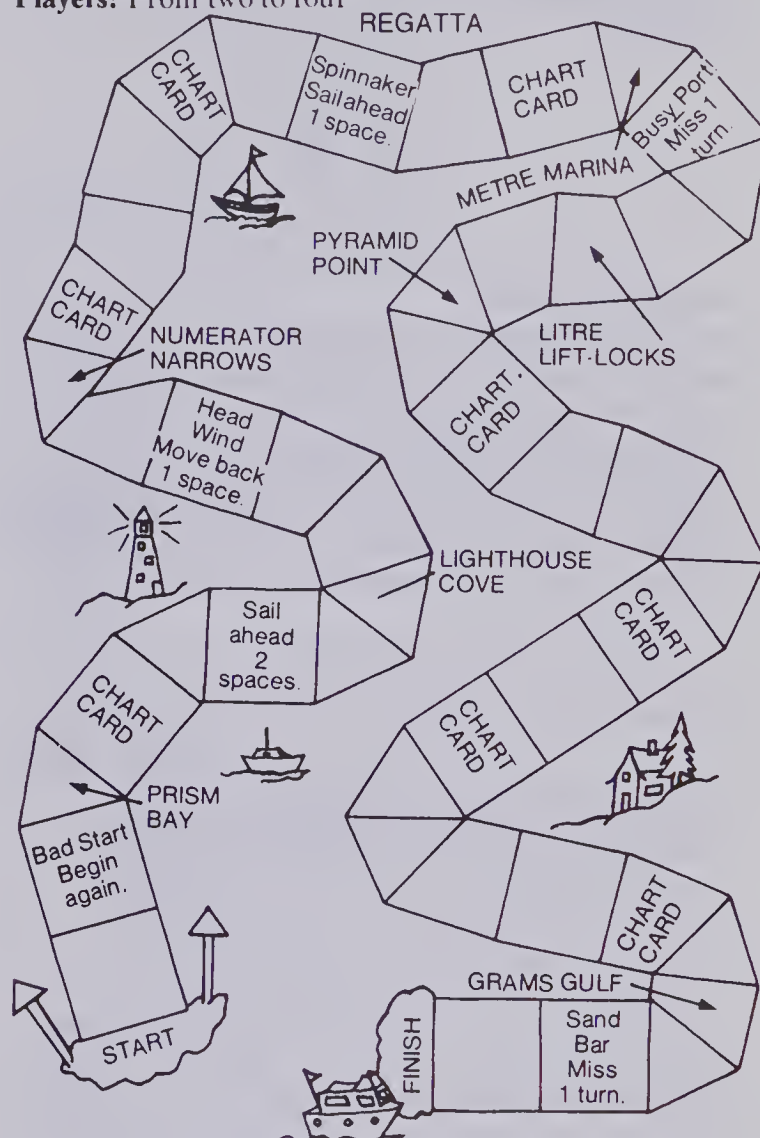
You may wish to (a) assign a five-second penalty for each error, (b) handicap or allow "laps" by having students start and finish at various points (A, B, or C), (c) play suitable race-track music.

REGATTA

Use: To practise basic facts; identifying transformations and shapes; calculating perimeter, area, and volume; and rounding

Materials: game board, die marked 1 to 6, index cards

Players: From two to four



The Game: Prepare a set (about 50) of "Cargo Cards" labelled according to the skills being tested (e.g., illustrations of slides, flips, turns; plane and 3D shapes; marked rectangular prisms labelled "volume?"; marked plane shapes labelled "perimeter?"; rounding cards labelled "78 → (nearest 10)"; missing number cards such as: " $6 \times \underline{\quad} = 18$ ", " $15 - \underline{\quad} = 3$ ", etc.

Prepare a set of "Chart Cards" (about 35) designed to slow or speed progress (e.g., oil slick! sail back 2 spaces; 1 free roll; tail wind, sail ahead 2 spaces; hurricane! go to Lighthouse Cove; becalmed! miss a turn; man overboard! go back 2 spaces, miss a turn; etc.).

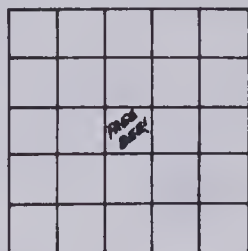
To begin, the first player rolls the die and draws a "Cargo Card". If the player correctly computes the card (or identifies the illustration as a slide, flip, turn, "right" angle, square, etc.), that player may advance the number of spaces indicated by the die. Players take turns rolling the die, completing "Cargo Cards", and obeying "Chart Cards" when necessary. Winner is the first player to "sail" to the finish line.

Variation: Use the above rules and materials with this twist: if an incorrect response is given to a Cargo Card, the player moves back the number of spaces indicated on the die.

BINGO

Use: To practise basic facts, arithmetic operations, mental computations, and naming geometric figures and shapes.

Materials: Blank game sheets, counters, paper and pencils for computations (if necessary, problem cards (optional))



Players: Any number

The Game: Distribute the blank game sheets. Have the players randomly select and write in numerals and/or words from a predetermined, displayed set of answers (e.g., numerals from 0 to 35; fractions from $\frac{1}{2}$ to $\frac{7}{7}$ inclusive; decimals from 0.0 to 2.9 inclusive; even dollar amounts from \$10 to \$40; names of plane and 3D shapes). Circulate to be sure that (a) all squares on the gamesheet are used and (b) no one number, word, shape, etc. has been repeated.

Call out or display a problem (e.g., 4×8 ; $\frac{4}{6} - \frac{3}{6}$; $\$2.25 + \3.75 , etc.) and have the players cover that number if it appears *anywhere* on their sheet. (Using "under the 'B'" and "under the 'G'" as in regular Bingo makes for too drawn out a game.)

There are various ways of declaring a winner:

- (a) five markers in a row vertically, horizontally, or diagonally.
- (b) four corners covered.
- (c) the whole sheet covered.

Emphasize that the first person to cover the required squares and raise her/his hand is the winner. Variations (a) and (b) are quickly completed. You may wish to put the call-out problems on cards and reward the winners by having them as the "caller" for the next round.

WHO HAS?

Use: To practise basic facts and basic arithmetic operations

To recognize multiples and factors, geometric shapes and figures, and equivalent fractions and decimals

Material: Blank playing or index cards

Players: From five to twenty

The Game: Make a set of cards that have an answer and a question as illustrated.

98
Who has 25 more?

123
Who has me $\div 3$?

41
Who has my double?

82
Who has 16 more?

You may use as many cards as you wish, taking care that the questions and answers eventually loop back to the initiator.

Cards are distributed to students in random order. The designated first player reads the card and says, "I have 98; who has 25 more?" The player holding the card with the answer says, "I have 123; who has me divided by 3?" Play continues through one complete round.

WHAT'S HAPPENING?

Use: To develop logical reasoning
To practise basic facts and arithmetic operations

Material: Chalkboard or overhead projector

Players: Any number

The Game: The leader or teacher asks a student for a number. If the student says "15", the leader answers, "I make it 25" and writes both responses on the board.

15 \rightarrow 25

The leader then asks for another number and performs the same rule or operation on it. Write both responses on the board.

6 \rightarrow 16

11 \rightarrow 21

When the leader feels a sufficient number of examples have been given, the leader asks "What's Happening?" Students should be able to give the rule — in this case, "Add 10 to the first number."

Variation: Instead of a student stating the rule, the student gives a pair of numbers that shows he/she knows the rule: 23 \rightarrow 33. This continues until most students have given a pair of numbers. Then the leader asks "What's Happening?"

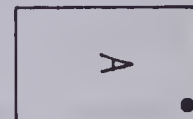
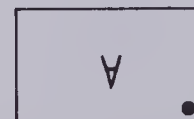
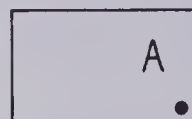
THE RELATION GAME

Use: To recognize slides, flips, and turns
To recognize a line of symmetry

Material: Blank playing or index cards

Players: From two to four

The Game: On blank playing cards print capital letters of the alphabet and the digits 0 through 9 in positions that are flips, turns, and slides (off centre) of the regular letters. Indicate the bottom of each card so it is possible to determine which motion is illustrated.



Divide the group into teams. Shuffle the cards and distribute equally amongst the students. The leader or teacher says, "I have an A." Students raise their hands if they have a card that shows a slide, flip, or turn of A. When asked, the student replies, "I have the (turn, flip, or slide)" and shows the card. Each correct answer scores 1 point.

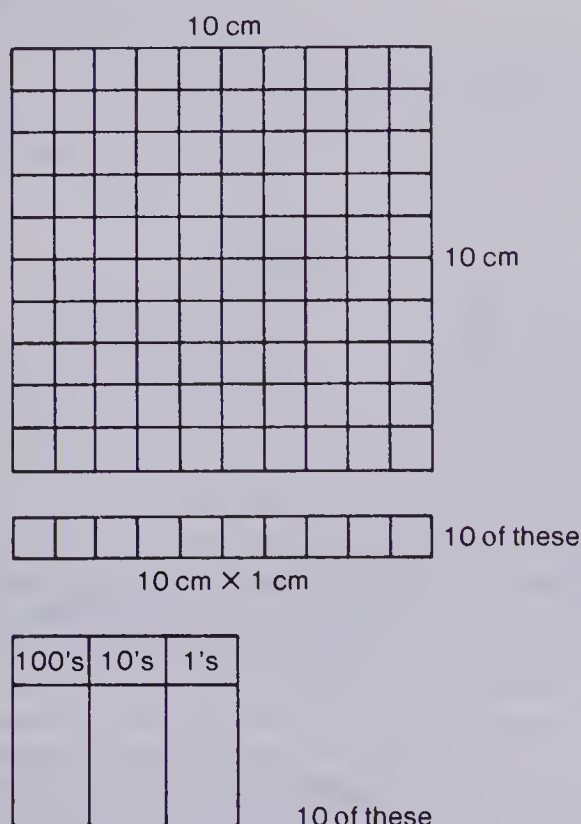
When the leader has gone through his/her set of cards he/she says, "Who sees a line of symmetry among the cards in their hand?" The students who do, raise their hands and demonstrate. Each correct answer scores 1 point. The team with the most points wins the game.

WHO AM I?

Use: To practise place value

To represent numbers using base-10 blocks

Materials: 100-squares, rods and unit squares (modify DM55 or use base-10 blocks), place-value charts plasticized, water soluble marker or duplicated blanks



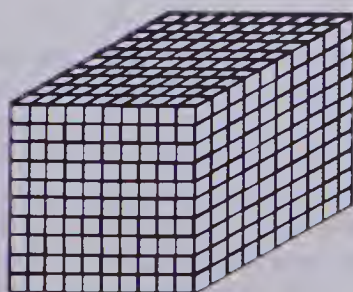
Players: Two

The Game: One player puts out a selection of rods and squares and asks, "Who am I?" The second player must write the number in the place-value chart and answer in this manner, "One hundred twenty-three". The students change roles. One point is scored for each correct answer — one for the place-value chart and one for the correct name.

Variations: 1. A player writes a number between 0 and 1000 in the place-value chart. A second student must make the number with the fewest pieces possible.

2. A student writes the name of a number between 0 and 1000 (i.e., one hundred twenty-three). The second player writes the number in the place-value chart and makes the number using the fewest pieces possible.

3. Extend the game by adding ten 1000-cubes. Numbers that can be used now are between 0 and 10 000.



4. Play a "Compare Us" game. Two players concealed from each other, put out a selection of squares, rods, etc. They then flip an index card that has been labelled "greater" on one side and "lesser" on the other. If the card lands with "greater" up, the player with the greater number gets a point. If the card lands with "lesser" up, the player with the lesser number gets the point. This game can be played with more than 2 players.

SUM-IT

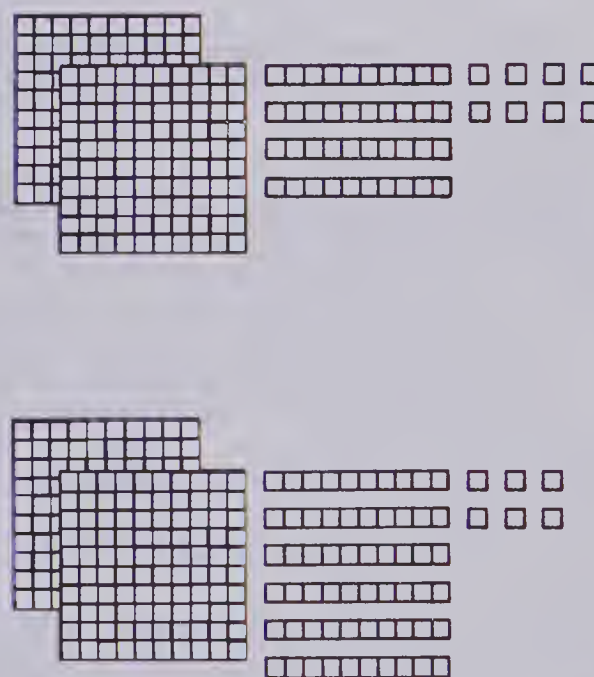
Use: To practise adding two-digit numbers where regrouping is involved

Materials: Squares, rods, and place-value charts as described for "Who Am I?"

Players: Two

The Game: The first player puts out two sets of large squares, rods, and unit squares as an addition problem and says, "Sum It!"

Example



The second player must (a) put the two sets together and regroup as necessary (i.e., cannot have more than 9 of any one kind), (b) record the two numbers in the place-value chart, and (c) add. The students reverse roles. One mark for each correct answer.

Variations: 1. For subtraction, the first player writes the numbers in the place-value chart and the second student must first put the appropriate number of large squares, rods, and unit squares out and then subtract (remove) the number indicated.

2. Extend the level of the game by adding ten 1000-cubes.

TOSS 'N' TELL

Use: To practise addition, multiplication, and subtraction

Materials: 4 markers each of a different colour, game board as shown
(24 cm × 24 cm marked off in 4 cm × 4 cm squares)

9	5	7
1	4	2
6	3	8

or, mark off a grid on the inside of a large box top. The sides of the top will keep the markers from rolling off the playing surface.)

Players: From two to four

The Game: One rule that always applies is that when a marker lands on a line it is considered to be on the greater of the two numbers adjacent to that line.

Addition: Each player, in turn, tosses two markers on the board, adds those two numerals together, and tells the sum. After each of the players has done this, the player with the highest sum gets one point. The player getting 5 points first is the winner.

Multiplication: As in addition, but multiply the two numbers together.

Subtraction: As in addition, but subtract the lesser numeral from the greater.

Variations: 1. The values of the numerals on the game board can be changed to meet the requirements of a particular class.

2. Whole numbers can be replaced by fractions or decimals.

3. Extend the two-addend game by:

(i) throwing 3 markers (add 3 numerals).

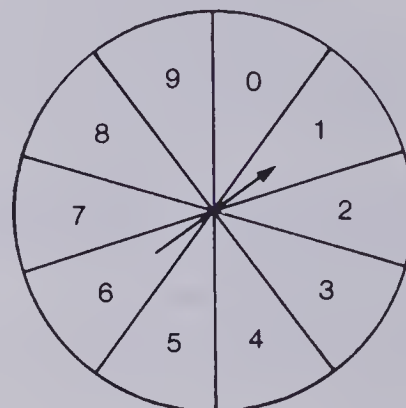
(ii) throwing 4 markers (add 4 numerals).

4. Increase the number of cells in the grid.

THE P.V. GAME

Use: To practise place-value skills involving comparing numbers

Materials: Construct a spinner using the digits 0 to 9. (Blank dice or number cards can also be used.)



Players: Any number (or two teams)

The Game: On a piece of paper, each player draws three blanks: ____ ____ ____ A designated player (or caller) twirls the spinner and calls out the indicated digit. The players may place this digit in any one of their three blank spaces. The caller repeats this procedure two more times. Each player uses the digits to build a "personal number". The player with the greatest number is the winner (or, the team to which the winner of the round belongs scores one point. The first team to score five points is the overall winner.). Students will soon develop strategies for placing the digits in the most potentially favourable position.

Variations: 1. Use 4 or 5 blanks to extend the game to thousands and ten thousands.

2. Play the same game for least number.

3. Practise comparing decimal numbers by using 4 to 6 blanks arranged for 2 decimal places.

4. Practise adding, subtracting, and comparing the answers by having the players draw sets of blanks for addition and subtraction.

_____	_____
+	_____
_____	_____
_____	_____

The numbers obtained by spinning are placed in the blanks. The player with the greatest sum (or difference) wins.

QUAD-ROW

Use: To practise addition facts, column addition, and computation

Materials: 15 counters in each of 4 colours, 5 dice with the numerals 1 to 6, game board (20 cm × 20 cm) as shown

Players: From two to four

The Game: Players may roll from one to five dice. As each player takes a turn, the sum of the numbers rolled indicates the square that may be covered on the board by that player.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
1	8	9	16	17	24	25	2	3	10
2	7	10	15	18	23	26	1	4	9
3	6	11	14	19	22	27	30	5	8
4	5	12	13	20	21	28	29	6	7
30	29	28	27	26	25	24	23	22	21
11	12	13	14	15	16	17	18	19	20
10	9	8	7	6	5	4	3	2	1

If a player rolls a total that has already been covered everywhere on the board, that player may roll one additional die and add this to his/her total. This number may then be covered if it is available. The first player to cover four in a row, i.e., "Quad-Row" horizontally, vertically, or diagonally wins the game. When all of a player's counters have been placed, that player may move a counter to a new location on each subsequent turn. This continues until the game has been won.

Variations: Use Quad-Row to practise multiplication. Prepare a game board as shown and use 3 dice.

1	2	3	4	5	6	8	9
10	12	15	16	18	20	24	25
27	30	32	36	40	45	48	50
54	60	64	72	75	80	90	96
100	108	120	125	144	150	180	216

Each player, in turn, throws 3 dice and finds the product of the numerals represented on the faces that are "up". After finding the product, the player covers the square containing the product with a coloured counter. (The diagram above illustrates the possible products. The order that these products are arranged on the board is not important.) If a product is already covered, the player throwing this product must miss a turn.

2. Use Quad-Row to practise division. Use a game board (20 cm × 20 cm) as shown and 1 die.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

A player may place a counter on a square that contains a number which is divisible by the number rolled (i.e., if a player rolls a 5, the player covers one of 5, 10, 15, . . . , 100).

FLASH

Use: To practise basic computational facts: addition, subtraction, multiplication, and division

Materials: Flash cards as indicated

Use rectangular pieces of heavy paper or cardboard. Write the problem on one side and the answer on the back.

$$4 + 9$$

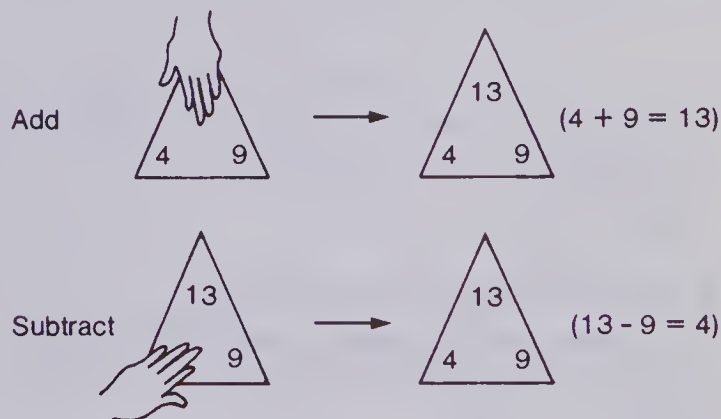
Front

$$13$$

Back

Triangular flash cards can also be used. When presenting to the class, keep the sum or difference covered, then remove to reinforce the correct answer.

Example



Players: Any number divided into teams

The Game: Divide the group into two teams. As leader, show a flash card to both teams in turn. Players in each team take turns responding. The team with the most correct responses is the winner.

Variations: 1. Place multiplication (division) facts on triangular cards.

2. Show the flash cards only to one team at a time. A team scores one point for each correct answer in a predesignated period of time (i.e., 2 min). The team with the most points when all teams have tried wins the round.

PROBLEMS OF THE WEEK

1. Write the next three numbers in each of the following patterns.

- (a) 1, 2, 4, 8, 16, ... 32, 64, 128 — double the number each time
 (b) 1, 4, 9, 16, 25, ... 36, 49, 56 — 1×1 , 2×2 , 3×3 , etc.
 (c) 1, 2, 4, 7, 11, ... 16, 22, 29 — difference is 1 more each time

2. Twelve toothpicks are arranged to make four squares.



Remove 2 toothpicks so as to have 2 squares left.

3. What 50 coins have a value of \$1.00?

1 — 25¢, 2 — 10¢, 2 — 5¢, 45 — 1¢

4. If you and four of your friends were each to shake hands with one another, how many handshakes would there be altogether? 10 handshakes

5. What is the greatest number of pieces a circle can be cut into using three straight line cuts? 7 pieces



6. Using any number of 4's and any mathematical operation you like, write expressions whose values are 1 through 10 inclusive.

E.g., $44 \div 44 = 1$

$(4 + 4) \div 4 = 2$

Various answers, including:

$(4 + 4 + 4) \div 4 = 3$

$4 + 4 - 4 = 4$

$4 \div 4 + 4 = 5$

$(4 + 4) \div 4 + 4 = 6$

$(44 \div 4) - 4 = 7$

$4 \times 4 - (4 + 4) = 8$

$4 + 4 + (4 \div 4) = 9$

$44 \div 4 - (4 \div 4) = 10$

7. Given any size square, divide it into 6 smaller squares.



8. Be careful of these. They are tricky.

(a) A farmer had 25 chickens. All but 16 of them were sent to market. How many chickens did the farmer have left? 16

(b) A rectangular hole measures 5 m by 3 m by 2 m. How many cubic metres of dirt are in the hole? 0 m³

9. Examine the first three questions carefully.

$$\begin{array}{r} 37\,037 \\ \times \quad 3 \\ \hline 111\,111 \end{array}$$

$$\begin{array}{r} 37\,037 \\ \times \quad 6 \\ \hline 222\,222 \end{array}$$

$$\begin{array}{r} 37\,037 \\ \times \quad 9 \\ \hline 333\,333 \end{array}$$

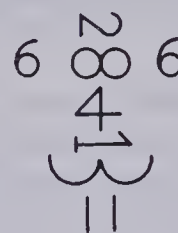
Find these products without doing any multiplying.

$$\begin{array}{r} 37\,037 \\ \times \quad 12 \\ \hline 444\,444 \end{array}$$

$$\begin{array}{r} 37\,037 \\ \times \quad 15 \\ \hline 555\,555 \end{array}$$

$$\begin{array}{r} 37\,037 \\ \times \quad 21 \\ \hline 777\,777 \end{array}$$

10. The sum of the numbers making Joe's portrait tells how old he is. What is his age? 41



11. Choose any 2-digit number. Multiply by 3. Add 6. Multiply by 4. Divide by 12. Subtract 2. What is the answer? original number

12. How many triangles? 16

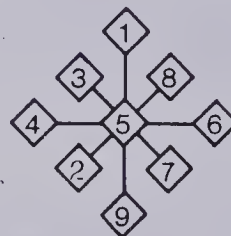


13. Use the digits 1 through 8 in order and any basic operation sign (+, −, ×, ÷) and make a true mathematics sentence equal to 9.

1 ■ 2 ■ 3 ■ 4 ■ 5 ■ 6 ■ 7 ■ 8 = 9

$1 + 2 \times 3 \times 4 + 5 - 6 - 7 - 8 = 9$ Remember: multiply first!

14.



Put the digits 1 through 9 in the diamonds, so that the sum of the digits in each row is 15.

15. Find the products without doing any multiplication.

$$9 \times 9 = 81$$

$$99 \times 99 = 9801$$

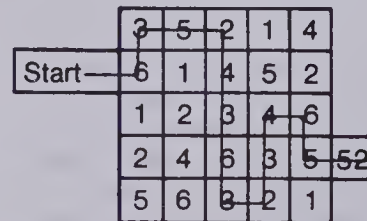
$$999 \times 999 = 998\,001$$

$$9999 \times 9999 = \underline{\hspace{2cm}} 99\,980\,001$$

$$99\,999 \times 99\,999 = \underline{\hspace{2cm}} 9\,999\,800\,001$$

$$999\,999 \times 999\,999 = \underline{\hspace{2cm}} 999\,998\,000\,001$$

16. Draw a path through the box so that the sum of the numbers in the path is equal to the number in the box to the right.



17. Draw the following figure without lifting your pencil.



18. In each question, different letters represent different digits. The sums are true. Solve each sum.

$$\begin{array}{r} \text{one } 231 \\ + \text{one } 231 \\ \hline \text{two } 462 \end{array}$$

$$\begin{array}{r} \text{two } 836 \\ + \text{two } 836 \\ \hline \text{four } 1672 \end{array}$$

$$\begin{array}{r} \text{you } 241 \\ + \text{can } 358 \\ \hline \text{add } 599 \end{array}$$

(Answers will vary. One answer is given for each.)

19. Put the digits 1 through 5 in each row and each column so no column or row contains the same digit more than once.

2	1	4	3	5
5	4	3	1	2
1	2	5	4	3
4	3	2	5	1
3	5	1	2	4

20. Use the numbers 11 through 18. Put them in the squares so that no squares having consecutive digits are touching.

12

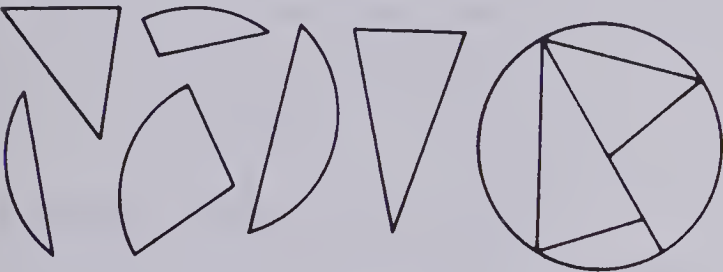
151816

131114

17

(Answers will vary.
One answer is given.)

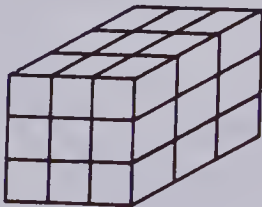
21. Make a circle from the following pieces.



22. Which would you sooner have — a 10 cm high stack of nickels or a 5 cm high stack of dimes? Why? Dimes are thinner so you'd get more money in the dime stack.

23. You promised to take three of your friends to the show. Which would be cheaper — to take your 3 friends on the same day or each of your 3 friends on separate days?
3 on the same day — buy 4 tickets, otherwise buy 6 tickets.

24. A cube measuring 3 cm × 3 cm × 3 cm is made up of 27 individual 1 cm³ cubes. The large cube is painted blue on all six faces.
How many 1 cm³ cubes are painted on exactly (a) 6 faces (b) 5 faces (c) 4 faces (d) 3 faces (e) 2 faces (f) 1 face (g) 0 faces?
(a) = 0, (b) = 0, (c) = 0, (d) = 8, (e) = 12, (f) = 6, (g) = 1

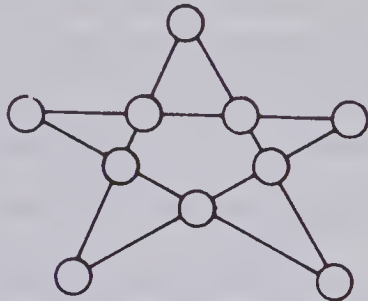


25. How many triangles in this figure? 14



26. Challenge: Separate 1, 2, 3, 4, 5, 6, 7, 8, and 9 kg masses into 3 piles, so that each pile has the same mass. (Answers will vary. One answer is given.)
(1) 9, 6
(2) 8, 7
(3) 1, 2, 3, 4, 5

27. Take 10 coins. Arrange them in five rows so that each row contains four coins.



28. Find the products without doing any multiplication.
 $1 \times 1 = 1$
 $11 \times 11 = 121$
 $111 \times 111 = 12\,321$
 $1111 \times 1111 = \underline{\hspace{2cm}} 1\,234\,321$
 $11\,111 \times 11\,111 = \underline{\hspace{2cm}} 123\,454\,321$

29. Peter is six years old. Pat is three years older than Priscilla. Priscilla is four years old. Paul is three years younger than Peter. Polly is five years younger than Pat.
(a) Who is youngest? Polly
(b) How old is the oldest? 7
(c) Peter is how much older than Polly? four years
(d) How old is Paul? 3
(e) How old was Polly one year ago? 1

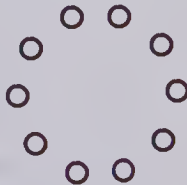
30. Find one number for ■ so that the number sentence $\blacksquare \times \blacksquare = \blacksquare + \blacksquare$ will be true. 2
Find another number that will work! 0

31. Find the next 3 numbers in this series.
1, 1, 2, 3, 5, 8, 13, __, __, __
21, 34, 55 Each number in the series is the sum of the preceeding two numbers.

32. Why are the numbers arranged this way?
 $\begin{array}{ccccccc} 1 & 4 & 7 & & & & \\ \hline 0 & 2 & 3 & 5 & 6 & 8 & 9 \end{array}$
 Upper line = straight lines only
 Lower line = curved lines

33. What are the next 5 letters in this series?
O, T, T, F, F, __, __, __, __, __
Hint: "Think about counting!"
O = one, T = two, etc. Each letter in the series is the first letter in the first ten natural numbers. The last 5 blanks = S, S, E, N, T.

34. Take ten counters and place them in a circle as shown in the diagram.

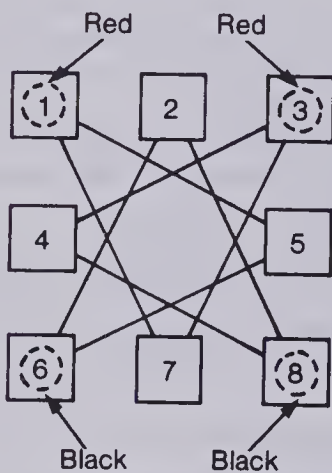


Players take turns removing one or two counters. If two are taken, they must be next to each other, with no open spaces or counters between them. Person who takes the last counter wins! Can you find a rule that helps you win? Whether the first player removes one or two counters, there will be a gap in the circle somewhere. The second player must take the same number of counters from the opposite side of the circle so that the counters are left divided into two equal groups. Second player can win if he takes a corresponding number of counters from one group as taken by the first player in the other group.

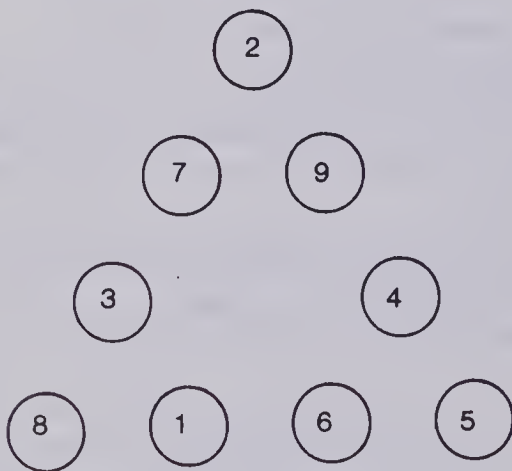
35. A scientist discovered that it took eighty minutes for her magic formula to work when she was wearing red shoes, and one hour and twenty minutes when she was wearing blue shoes. Can you explain this?
No explanation. 80 minutes = 1 hour and 20 minutes!

36. Use three 9's to equal 90. You may use +, -, × and ÷.
Find two different answers. (1) $99 - 9$ (2) $9 \times 9 + 9$

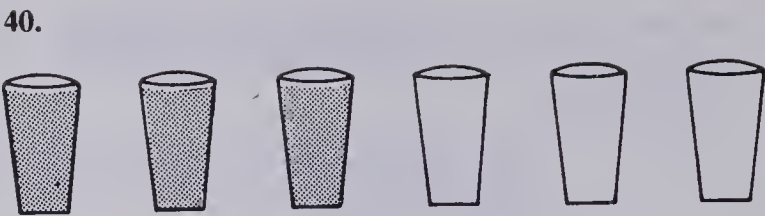
37. Construct a diagram as shown. Place red checkers on boxes 1 and 3, and black checkers on boxes 6 and 8, as shown. Puzzle: Move one checker at a time, in any order, along one of the straight lines from box to box, until the checkers have changed places, the red checkers being on 6 and 8, and the black checkers on 1 and 3. More than one checker cannot be in a box at the same time. What are the fewest number of moves? 16



38. Place the numbers from 1 to 9 inside the circles so that the sum along each side will be 20. Use each number only once.
(Answers will vary. One answer is given.)



39. If 3 students can eat a total of 3 granola bars in 3 min, how long would it take 50 students to eat 50 granola bars? 3 min



The 3 glasses on the left are filled with water. The 3 glasses on the right are empty. By touching only one glass, can you make a pattern of full, empty, full, empty, full, empty?
Moving left to right, take the second full glass and pour contents into the fifth glass. Replace the emptied glass in its original position.

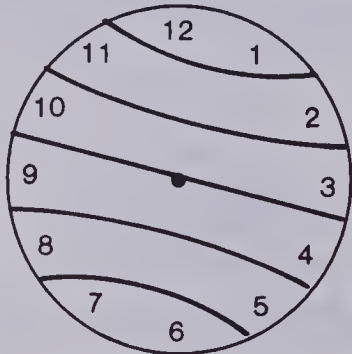
41. Magic squares have the same sum whether added horizontally, vertically, or diagonally. The sum in this magic square is 30. Find the missing numbers.

16	2	12
6	10	14
8	18	4

42. I have six pieces of chain, each with four links. If it costs 10¢ to cut open a link and 25¢ to weld it together again, how much will it cost me to have the six sections joined into one chain?
\$1.40 Cut open all four links of one section, and use these four to join the five remaining sections together.

43. Find 3 whole numbers in a row which have a product of 720. $\underline{\hspace{1cm}} \times \underline{\hspace{1cm}} \times \underline{\hspace{1cm}} = 720$ $8 \times 9 \times 10$

44. Divide the clock into six parts of any size and shape so that the sum of the numbers in each part is the same.



CUMULATIVE TEST ITEM BANK


These items test a number of the major objectives in this book. In using these test items, select from the set up to the page on which your class is working at present. Set A and Set B are matched items to provide opportunity for a pre and post testing or for repeat testing of the objectives. The pages can be easily removed and duplicated if you wish to distribute the test. Be certain that all of the children are familiar with the accepted answer format, whether it involves writing answers directly on a duplicated sheet, or on a separate sheet or workbook page. Demonstrate the sample items on the chalkboard and be sure there are no questions before beginning the test.

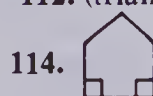
Sample Items

Copy and complete.	Add.
36 = <u> </u> tens and <u> </u> ones	$\begin{array}{r} 4 \\ +5 \\ \hline \end{array}$

Answers to Test

1. 62 2. 38 3. 63 4. 92 5. 7 6. 8 7. 7 doughnuts left. 8. 17 cookies left. 9. 15 10. 16 11. 705
 12. 390 13. 442 14. 543 15. 33 16. 23 17. 368
 18. 336 19. 477 20. 236 21. 37 095 22. 60 829 23. >
 24. > 25. 785 235 26. 553 353 27. 6166 28. 8392
 29. 45 179 30. 47 337 31. 3327 more passengers on Monday. 32. 2354 more passengers on Monday.
 33. 60 cm 34. 80 cm 35. 300 cm 36. 500 cm 37. (b) 22 cm 38. (b) 18 cm 39. CCXLVII 40. CXLV
 41. $5 \times 6 = 30$ 42. $4 \times 7 = 28$ 43. 16, 20, 24, 28, . . . , 40. Add 4. 44. 20, 25, 30, . . . , 50. Add 5. 45. 36
 46. 40 47. even 48. odd 49. 1600 50. 1300 51. 40
 52. 50 53. 195 54. 212 55. 700 56. 600 57. $2 \times 300 = 600$, $2 \times 400 = 800$. Exact answer between 600 and 800. 58. $3 \times 400 = 1200$, $3 \times 500 = 1500$. Exact answer between 1200 and 1500. 59. 1012 60. 822
 61. $15 \div 5 = 3$ 62. $24 \div 4 = 6$ 63. 6 packages 64. 3 packages 65. 7 66. 8 67. 5R4 68. 6R2 69. 30
 70. 30 71. 68R1 72. 38R1 73. 90 74. 40 75. $\frac{1}{4}$
 76. $\frac{1}{4}$ 77. 0.9 78. 0.7 79. 0.5 dm 80. 0.8 dm

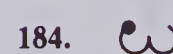
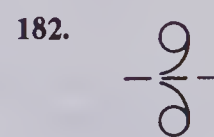
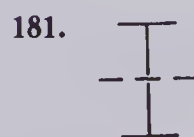
81. 0.9 82. 0.9 83. 3.5 84. 4.6 85. 11.3 86. 13.2
 87. 2.7 88. 1.7 89. \$3.71 90. \$3.03 91. \$6.52
 92. \$7.00 93. \$4.39 94. \$3.78 95. 272 tiles 96. 168 tiles 97. 4 98. 5 99. 4 km 100. 6 km 101. 10 cm
 102. 13 cm 103. various 104. various 105. \$2.72
 106. \$1.68 107. 6 faces 108. 6 faces 109. \square
 110.  111. pyramid 112. (triangular) prism



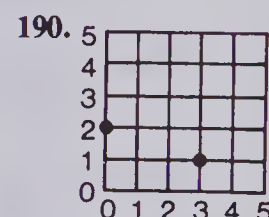
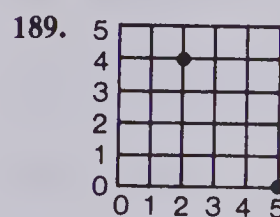
115. cylinder 116. cone 117. 69 118. 848

121. 0.09 122. 0.07 123. $\frac{63}{100}$ 124. $\frac{58}{100}$ 125. 2 tens, 3 ones, 5 tenths, 7 hundredths 126. 4 tens, 1 one,

0 tenths, 6 hundredths 127. 335.21 128. 27.29 129. <
 130. > 131. 17.9 132. 20.9 133. 936 134. 706
 135. The steel bridge is 136.1 m longer. 136. The concrete bridge is 145.5 m larger. 137. $0.8 - 0.4 = 0.4$ 138. $0.5 + 0.3 = 0.8$ 139. $n = 8$ 140. $n = 8$ 141. 14 roller skates 142. 18 skateboards 143. 87 144. 49
 145. 2.57 146. 3.28 147. 1081 148. 1344 149. 7925
 150. 9568 151. 541 152. 333 153. 14 cm^2 154. 36 cm^2
 155. 352 156. 900 157. 24 cm^3 158. 30 cm^3
 161. Paula 162. 35 s 163. Don, April 164. Sandy
 165. 175 stamps 166. Bob has 50 more stamps than Sarah. 167. 37.6°C 168. 41.4°C 169. 38.8°C
 170. 39.2°C 171. 300 s 172. 72 h 175. an angle
 176. an angle 178. A,B



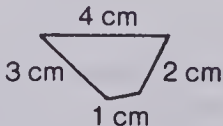
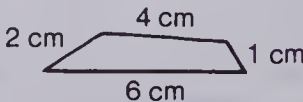








185. (2,3) 186. (5,5) 187. (1,6) 188. (4,1)

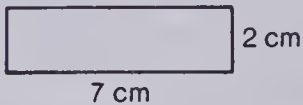
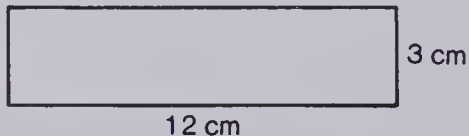
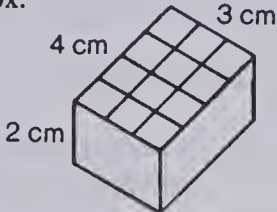
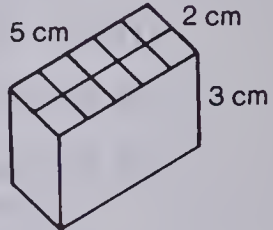
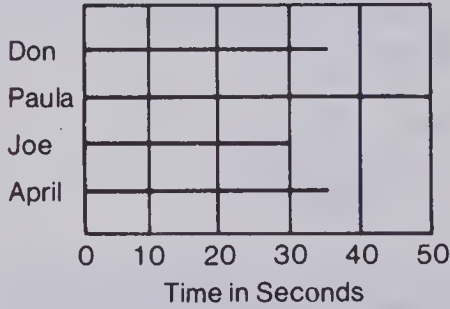
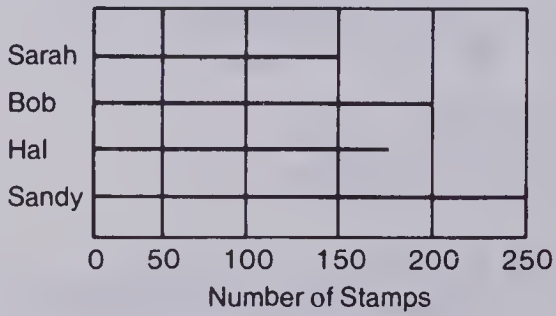


Page	A	B
10	1. Write a numeral for: 6 tens and 2 ones.	2. Write a numeral for: 3 tens and 8 ones.
	3. Add. $\begin{array}{r} 27 \\ +36 \\ \hline \end{array}$	4. Add. $\begin{array}{r} 58 \\ +34 \\ \hline \end{array}$
	5. Solve. $15 - \blacksquare = 8$	6. Solve. $21 - \blacksquare = 13$
	7. 26 doughnuts. 19 eaten. How many doughnuts left?	8. 34 cookies. 17 eaten. How many cookies left?
	9. Add. $\begin{array}{r} 3 \\ 6 \\ 2 \\ +4 \\ \hline \end{array}$	10. Add. $\begin{array}{r} 8 \\ 1 \\ 2 \\ +5 \\ \hline \end{array}$
20	11. Write a numeral for: 7 hundreds 0 tens 5 ones.	12. Write a numeral for: 3 hundreds 9 tens 0 ones.
	13. Add. $\begin{array}{r} 168 \\ +274 \\ \hline \end{array}$	14. Add. $\begin{array}{r} 195 \\ +348 \\ \hline \end{array}$
	15. Subtract. $\begin{array}{r} 52 \\ -19 \\ \hline \end{array}$	16. Subtract. $\begin{array}{r} 41 \\ -18 \\ \hline \end{array}$
	17. Subtract. $\begin{array}{r} 726 \\ -358 \\ \hline \end{array}$	18. Subtract. $\begin{array}{r} 532 \\ -196 \\ \hline \end{array}$
	19. Subtract. $\begin{array}{r} 604 \\ -127 \\ \hline \end{array}$	20. Subtract. $\begin{array}{r} 803 \\ -567 \\ \hline \end{array}$
30	21. Write a numeral for: 3 ten thousands, 7 thousands, 0 hundreds, 9 tens, 5 ones.	22. Write a numeral for: 6 ten thousands, 0 thousands, 8 hundreds, 2 tens, 9 ones.
	23. Compare. Use $>$, $<$, or $=$. $6245 \bullet 6219$	24. Compare. Use $>$, $<$, or $=$. $3182 \bullet 3147$
	25. Add. $\begin{array}{r} 536\,098 \\ +249\,137 \\ \hline \end{array}$	26. Add. $\begin{array}{r} 418\,257 \\ +135\,096 \\ \hline \end{array}$
	27. Add. $\begin{array}{r} 212 \\ 3605 \\ +2349 \\ \hline \end{array}$	28. Add. $\begin{array}{r} 301 \\ 4272 \\ +3819 \\ \hline \end{array}$
	29. Subtract. $\begin{array}{r} 60\,417 \\ -15\,238 \\ \hline \end{array}$	30. Subtract. $\begin{array}{r} 70\,526 \\ -23\,189 \\ \hline \end{array}$
40	31. 4712 passengers on Monday. 1385 passengers on Tuesday. How many more on Monday?	32. 3821 passengers on Monday. 1467 passengers on Tuesday. How many more on Monday?

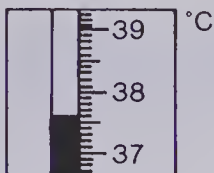
Page	A	B
50	<p>33. ___ cm = 6 dm</p> <p>35. ___ cm = 3 m</p> <p>37. The width of a textbook is about: (a) 22 mm (b) 22 cm (c) 22 dm (d) 22 m</p>	<p>34. ___ cm = 8 dm</p> <p>36. ___ cm = 5 m</p> <p>38. The length of a new pencil is about: (a) 18 mm (b) 18 cm (c) 18 dm (d) 18 m</p>
60	<p>39. Rewrite using a Roman numeral. 247</p> <p>41. Write a multiplication sentence for this addition sentence. $6 + 6 + 6 + 6 + 6 = 30$</p> <p>43. Continue the pattern and give the rule. 4, 8, 12, __, __, __, __, __, __ Add ■.</p>	<p>40. Rewrite using a Roman numeral. 145</p> <p>42. Write a multiplication sentence for this addition sentence. $7 + 7 + 7 + 7 = 28$</p> <p>44. Continue the pattern and give the rule. 5, 10, 15, __, __, __, __, __, __ Add ■.</p>
70	<p>45. Complete. Since $4 \times 9 = 36$, then $9 \times 4 = \blacksquare$.</p> <p>47. Is 18 an even or odd number?</p>	<p>46. Complete. Since $5 \times 8 = 40$, then $8 \times 5 = \blacksquare$.</p> <p>48. Is 21 an even or odd number?</p>
80	<p>49. Multiply. 16×100</p> <p>51. Round 37 to the nearest multiple of 10.</p>	<p>50. Multiply. 13×100</p> <p>52. Round 48 to the nearest multiple of 10.</p>
90	<p>53. Multiply. $\begin{array}{r} 65 \\ \times 3 \\ \hline \end{array}$</p>	<p>54. Multiply. $\begin{array}{r} 53 \\ \times 4 \\ \hline \end{array}$</p>
	<p>55. Round 718 to the nearest multiple of 100.</p> <p>57. Show how you would estimate the product of 2×348.</p>	<p>56. Round 623 to the nearest multiple of 100.</p> <p>58. Show how you would estimate the product of 3×419.</p>
100	<p>59. Multiply. $\begin{array}{r} 253 \\ \times 4 \\ \hline \end{array}$</p> <p>61. Write a related division sentence for $3 \times 5 = 15$.</p> <p>63. 18 model trucks. 3 in each package. How many packages?</p>	<p>60. Multiply. $\begin{array}{r} 274 \\ \times 3 \\ \hline \end{array}$</p> <p>62. Write a related division sentence for $6 \times 4 = 24$.</p> <p>64. 21 model cars. 7 in each package. How many packages?</p>
110	<p>65. Divide. $8 \overline{)56}$</p> <p>67. Divide. $5 \overline{)29}$</p> <p>69. Divide. $4 \overline{)120}$</p>	<p>66. Divide. $6 \overline{)48}$</p> <p>68. Divide. $4 \overline{)26}$</p> <p>70. Divide. $6 \overline{)180}$</p>
120	<p>71. Divide. $2 \overline{)137}$</p>	<p>72. Divide. $3 \overline{)115}$</p>

Page	A	B
130	73. Divide. $9000 \div 100$	74. Divide. $4000 \div 100$
	75. What part is coloured? 	76. What part is coloured? 
	77. Write $\frac{9}{10}$ as a decimal.	78. Write $\frac{7}{10}$ as a decimal.
140	79. 5 cm = __ dm	80. 8 cm = __ dm
	81. Add. $\begin{array}{r} 0.4 \\ +0.5 \\ \hline \end{array}$	82. Add. $\begin{array}{r} 0.7 \\ +0.2 \\ \hline \end{array}$
	83. Write as a decimal. 3 ones and 5 tenths	84. Write as a decimal. 4 ones and 6 tenths
150	85. Add. $\begin{array}{r} 6.9 \\ +4.4 \\ \hline \end{array}$	86. Add. $\begin{array}{r} 5.4 \\ +7.8 \\ \hline \end{array}$
	87. Subtract. $\begin{array}{r} 7.3 \\ -4.6 \\ \hline \end{array}$	88. Subtract. $\begin{array}{r} 5.6 \\ -3.9 \\ \hline \end{array}$
	89. How much change? Ball: \$1.29 Paid: 1 five-dollar bill	90. How much change? Sweater: \$6.97 Paid: 1 ten-dollar bill
160	91. Add. $\$3.25 + \$0.75 + \$2.52$	92. Add. $\$2.15 + \$0.65 + \$4.20$
	93. Had: \$13.55 Spent: \$9.16 How much was left?	94. Regular Price: \$11.37 Sale Price: \$7.59 How much is saved?
	95. 34 boxes of floor tile. 8 tiles in each box. How many tiles altogether?	96. 28 boxes of ceiling tile. 6 tiles in each box. How many tiles altogether?
170	97. Find the average of 2, 4, and 6.	98. Find the average of 3, 5, and 7.
	99. Saul walked 1 km in 12 min. How far can he walk in 48 min?	100. Susan walked 2 km in 20 min. How far can she walk in 60 min?
	101. Find the perimeter. 	102. Find the perimeter. 
180	103. Name two things you would measure in grams.	104. Name two things you would measure in litres.
	105. Patrick bought a light for \$12.39 and a horn for \$4.89 for his bicycle. How much change should he receive from a twenty-dollar bill?	106. Kathleen bought a doll for \$8.95 and some doll clothes for \$4.37. How much change should she receive from \$15.00?
	107. How many faces does a cube have?	108. How many faces does a box have?

Page	A	B																														
190	<p>109. Draw a square.</p> <p>111. Name the shape.</p> 	<p>110. Draw a rectangle.</p> <p>112. Name the shape.</p> 																														
200	<p>113. Mark the corners that are right angles.</p> 	<p>114. Mark the corners that are right angles.</p> 																														
	<p>115. Name the shape.</p> 	<p>116. Name the shape.</p> 																														
	<p>117.</p> <table border="1"><tr><td>Grade</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>Number of Pupils</td><td>49</td><td>54</td><td>78</td><td>63</td><td>69</td><td>78</td></tr></table> <p>How many pupils in Grade 5?</p>	Grade	1	2	3	4	5	6	Number of Pupils	49	54	78	63	69	78	<p>118.</p> <table border="1"><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>A</td><td></td><td>379</td><td>592</td></tr><tr><td>B</td><td>379</td><td></td><td>848</td></tr><tr><td>C</td><td>592</td><td>848</td><td></td></tr></table> <p>How far from C to B?</p>		A	B	C	A		379	592	B	379		848	C	592	848	
Grade	1	2	3	4	5	6																										
Number of Pupils	49	54	78	63	69	78																										
	A	B	C																													
A		379	592																													
B	379		848																													
C	592	848																														
210	<p>119. Draw a pictograph to show 8 red cars, 5 blue cars, and 11 green cars.</p>	<p>120. Draw a pictograph to show 6 pennies, 9 nickels, and 10 dimes.</p>																														
	<p>121. Write $\frac{9}{100}$ as a decimal.</p> <p>123. Write 0.63 as a fraction.</p>	<p>122. Write $\frac{7}{100}$ as a decimal.</p> <p>124. Write 0.58 as a fraction.</p>																														
220	<p>125. Write the place value of each digit for 23.57.</p>	<p>126. Write the place value of each digit for 41.06.</p>																														
	<p>127. Add.</p> $\begin{array}{r} 312.32 \\ + 22.89 \\ \hline \end{array}$	<p>128. Subtract.</p> $\begin{array}{r} 243.11 \\ - 215.82 \\ \hline \end{array}$																														
	<p>129. Compare. Use $>$, $=$, or $<$. 0.3 \bullet 0.32</p>	<p>130. Compare. Use $>$, $=$, or $<$. 2.28 \bullet 2.2</p>																														
230	<p>131. Find the missing addend. $\blacksquare + 5.7 = 23.6$</p>	<p>132. Find the missing addend. $\blacksquare + 6.2 = 27.1$</p>																														
	<p>133. Add.</p> $\begin{array}{r} 186 \\ 203 \\ + 547 \\ \hline \end{array}$	<p>134. Add.</p> $\begin{array}{r} 107 \\ 346 \\ + 253 \\ \hline \end{array}$																														
	<p>135. A steel bridge is 261.3 m long. A wooden bridge is 125.2 m long. How much longer is the steel bridge?</p>	<p>136. A concrete bridge is 284.1 m long. A wooden bridge is 138.6 m long. How much longer is the concrete bridge?</p>																														
240	<p>137. Change to decimals, then subtract. $\frac{4}{5} - \frac{2}{5} = \blacksquare$</p> <p>139. Find the missing factor. $6 \times n = 48$</p>	<p>138. Change to decimals, then add. $\frac{1}{2} + \frac{3}{10} = \blacksquare$</p> <p>140. Find the missing factor. $4 \times n = 32$</p>																														

Page	A	B
	<p>141. n roller skates. 2 roller skates in each box. 7 boxes. How many roller skates altogether?</p>	<p>142. n skateboards. 3 skateboards in each box. 6 boxes. How many skateboards altogether?</p>
250	<p>143. Multiply. 8.7×10</p>	<p>144. Multiply. 4.9×10</p>
	<p>145. Divide. $25.7 \div 10$</p>	<p>146. Divide. $32.8 \div 10$</p>
	<p>147. Multiply. $\begin{array}{r} 47 \\ \times 23 \\ \hline \end{array}$</p>	<p>148. Multiply. $\begin{array}{r} 56 \\ \times 24 \\ \hline \end{array}$</p>
	<p>149. Multiply. $\begin{array}{r} 317 \\ \times 25 \\ \hline \end{array}$</p>	<p>150. Multiply. $\begin{array}{r} 416 \\ \times 23 \\ \hline \end{array}$</p>
260	<p>151. Divide. $6 \overline{) 3246}$</p>	<p>152. Divide. $8 \overline{) 2664}$</p>
	<p>153. Find the area.</p>	<p>154. Find the area.</p>
270		
	<p>155. Find the product. $4 \times 11 \times 8 = \underline{\hspace{2cm}}$</p>	<p>156. Find the product. $6 \times 10 \times 15 = \underline{\hspace{2cm}}$</p>
	<p>157. Find the number of cubic centimetres in the box.</p>	<p>158. Find the number of cubic centimetres in the box.</p>
280		
	<p>159. Draw a bar graph to show the distance in metres of the following softball throws: John — 30 m; Sue — 35 m; Mel — 40 m.</p>	<p>160. Draw a bar graph to show the number of books read by each: Kathy — 8 books; Mark — 10 books; Marie — 13 books.</p>
	<p style="text-align: center;">Running Contest</p> 	<p style="text-align: center;">Stamp Collections</p> 
	<p>161. Who ran the fastest?</p>	<p>164. Who has the most stamps?</p>
	<p>162. How long did it take Don to run the distance?</p>	<p>165. How many stamps has Hal?</p>
290	<p>163. Which two children had the same time?</p>	<p>166. How many more stamps has Bob than Sarah?</p>

167. What is the thermometer reading?



169. Normal body temperature is 37°C . Tara's temperature is 1.8°C above normal. What is her temperature?

171. How many seconds in 5 min?

173. Draw 2 lines that are parallel.

175. What is the name of the figure below?



177. Draw 2 shapes that are congruent.

179. Trace this letter. Then draw a second letter S to show a slide.

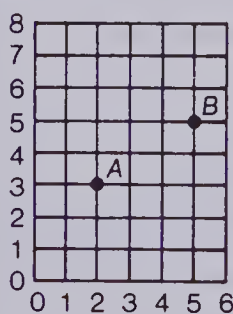


181. Draw the letter T and show it flipped over the line.



183. Draw the shape below and draw it after a $\frac{1}{2}$ turn.

Point of rotation

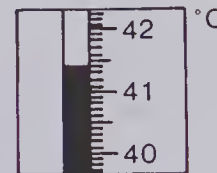


185. Write the ordered pair for A.

186. Write the ordered pair for B.

189. Draw a 5×5 grid and locate the points (2,4) and (5,0) on the grid.

168. What temperature does the thermometer show?



170. The outside temperature reached a high of 43.5°C . By evening the temperature had dropped 4.3°C . What was the evening temperature?

172. How many hours in 3 d?

174. Draw 2 lines that are not parallel.

176. What is the name of the figure below?



178. Which two shapes are congruent?



180. Trace this numeral. Then draw a second numeral 5 to show a slide.

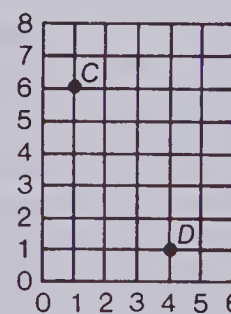


182. Draw the numeral 9 and show it flipped over the line.



184. Draw the shape below and then draw it after a $\frac{1}{4}$ turn.

Point of rotation



187. Write the ordered pair for C.

188. Write the ordered pair for D.

190. Draw a 5×5 grid and locate the points (3,1) and (0,2) on the grid.

CHAPTER 1 OVERVIEW

This chapter develops the concept of place value and operations of addition and subtraction of whole numbers to "hundreds" with regrouping. It also develops the order (commutative) and grouping (associative) properties as an aid to computation. A suggested format for, and practice with, problem solving is included.

OBJECTIVES

- A To write the place value of whole numbers using various forms to hundreds
- B To add up to 3-digit whole numbers without and with regrouping
- C To subtract up to 3-digit whole numbers without and with regrouping
- D To solve simple word problems

BACKGROUND

Place value and the operations.

We use a set of ten digits (0 to 9) and a place-value system based on groups of ten. The value of a digit depends on its placement in the system. The value of a number is the sum of products represented by the digits in the numeral. (For example, $625 = 6 \text{ hundreds plus } 2 \text{ tens plus } 5 \text{ ones.}$)

The operations of addition and subtraction are directly related to the place-value system. Successful computation depends on an understanding of our number system, particularly when regrouping occurs.

Problem solving.

The Process:

While approaches to problem solving may vary somewhat, there are generally considered to be 5 basic steps in the problem-solving process. These are: 1. Reading the problem (What is the question about?) 2. Interpretation (What is being asked? What are the important facts?) 3. Representation (What should you do?) 4. Calculation (Write a number sentence to solve the problem) 5. Conclusion (Final statement). The steps are presented to the students on page 10.

The format:

The lessons on pages 8, 10, and 11 attempt to provide an organizational framework within which students can solve some word problems. Professor Q's four questions are reviewed as a method to organize and clarify data.

Some students who have developed basic organizational skills may find that writing answers to Professor Q's questions is a burdensome task. Encourage these pupils to deal with the questions mentally. Students with weak organizational skills should write brief answers but, as their skills improve, should be encouraged to make the process a mental exercise.

You may wish to include your own ideas for a problem-solving format. For example, many teachers include a column on the right-hand side of the page for any *necessary* computational work. Whatever additions you make, consider the following guidelines.

(a) The student's work should clearly communicate to you (or any student) the thought process used to solve the problem.

(b) Any *necessary* computational work should be considered as part of the solution.

(c) The "number" generated by the computation should be expressed, using the appropriate units, in a sentence that answers the question being asked in the problem.

Presented below are three suggested formats, each succeeding one designed for students who require less organizational structure. As they gain confidence and competence with problem solving, most students should be able to use Format 3 with consistent success. (Some students may occasionally revert to Formats 2 or 1 as they meet more difficult problems.)

Library Books.

12 books about horses were borrowed by the Grade 4 class.

19 books about dogs were borrowed by the Grade 5 class.

How many books were borrowed altogether?

FORMAT 1.

Answers to Professor Q's four questions.

(written)

- (i) Books
- (ii) How many books altogether?
- (iii) 12 books, 19 books
- (iv) Add.

Books: $12 + 19 = \blacksquare$	(Computation)
$12 + 19 = 31$	12
There were 31 books borrowed altogether.	$+ 19$
	31

FORMAT 2.

Answers to Professor Q's four questions.

(done mentally)

Books: $12 + 19 = \blacksquare$	(Computation)
$12 + 19 = 31$	12
There were 31 books borrowed altogether.	$+ 19$
	31

FORMAT 3.

Answers to Professor Q's four questions.

(done mentally)

$12 + 19 = 31$	(Computation)
There were 31 books borrowed altogether.	12
	$+ 19$
	31

MATERIALS

counters
Cuisenaire® rods or rods or Centicubes* or base-ten blocks
math balance
number cards

CAREER AWARENESS

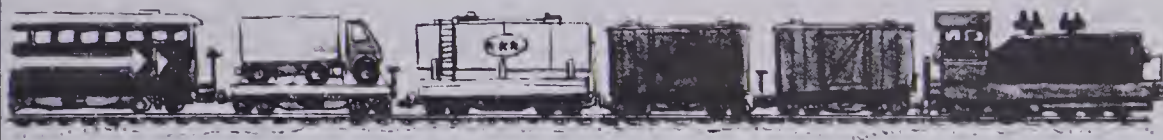
Flight Attendant [25]

The first people you are liable to meet upon boarding a commercial airplane are the flight attendants. Their friendly greetings and warm smiles help to put

(Continued on page 25)

*By permission of E.S. Perry Limited, Osmiroid Works, Gosport, England.

Numbers

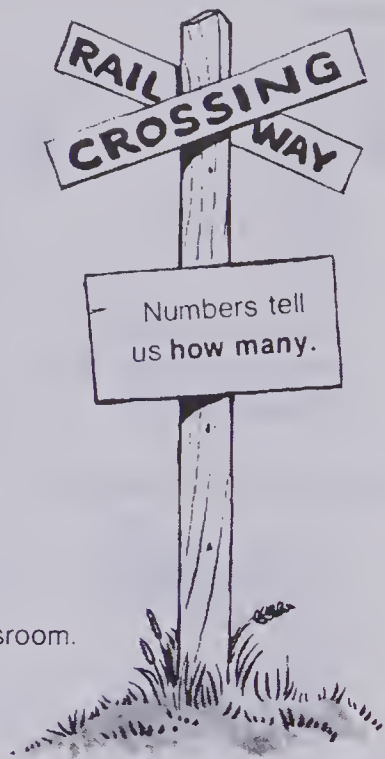


Engineer Joe uses these ten digits to show numbers.

0 1 2 3 4 5 6 7 8 9

Exercises

1. Use digits to help Engineer Joe.
 - (a) one engine: 1
 - eight passenger cars: ■ 8
 - fourteen freight cars: ■ 14
 - (d) five oil tank cars: ■ 5
 - (e) ten refrigerator cars: ■ 10
 - (f) twelve flat cars: ■ 12
 - (g) no dining cars: ■ 0
2. Use digits to show the following
 - (a) the number of letters in your first name
 - (b) the number of months in a year 12
 - (c) the number of students in your classroom
 - (d) your age
 - (e) the number of lions in your classroom
3. Make a list of five **different** things in your classroom. Use digits to tell **how many** of each. Compare your list with a friend.



Writing whole numbers 1

Using the Book Many of your students will already be familiar with the content of this page — indeed, of many of the pages of this initial chapter. These pages lend themselves nicely, not only to a review of what has been studied previously, but also to the laying of the ground rules of what will be the accepted “communication procedure” for this textbook and your particular classroom. Whether the children answer in workbooks or on sheets; whether they transcribe questions or simply supply answers; how the exercise responses should be labelled and identified; what the standards of neatness and the marking or feedback procedures are — all of these issues should be clearly addressed now as the children complete these initial review pages. You may wish to prepare a model or demonstrate using the chalkboard or overhead projector. Have the children supply the correct answer while you use the accepted format to record the results. At this time, inform the students that the red “bullet” on some exercises (1(b) and 1(c) on this page) mean that the answers to these are located in the Answers to Selected Problems section at the back of the book (pages 338-343). Explain that sometimes they will be using the bulleted questions to see if they “are on the right track”. At other times, the children will complete the bulleted questions orally or together as a group. Many children may benefit from watching as the sample exercises are marked. Be sure to familiarize the class with what the various teacher notations mean and what to do about corrections (see Using the Book, page 6).

OBJECTIVE

To assign a whole number to a set of objects either real or described in written form, using the digits 0 to 9

PACING

Level A All
Level B All
Level C All

VOCABULARY

digit(s), number(s), “how many”

MATERIALS

counters

SUGGESTIONS

Initial Activity The extent of the introduction will depend on the background of your students. One appropriate exercise is to have students discuss occasions when and where numbers are used to indicate “how many”. For example, the number of players on a hockey team, the number of brothers and sisters, number of pets, etc. If counters are readily available in your classroom, provide each child with a pile. Each child is asked to take a handful and find out “how many” counters there are. Reverse the procedure by saying, “Show me thirteen counters, eight counters”, and so on. Students should become aware that our number system uses only the digits 0 to 9 and that the digits can be used in appropriate combinations or groups to represent any whole number.

ACTIVITIES

1. Children might enjoy looking through magazines and newspapers for examples of the ways numbers can tell us “how many”.

635 Attend City Hall Ceremonies.

Teenager Wins \$5000.00 in Lottery!

Appropriate examples could be displayed on a bulletin board.

2. Challenge students to think of as many questions as they can which require the use of numbers in the answer, e.g., “What is the temperature outside today? How tall are you? How many floors in your apartment building? What time is it?” You may wish to involve the whole class, or make it a small group project.

3. Some children might like to create a number collage by cutting out digits from coloured paper and pasting them on a large sheet of paper to be displayed on the bulletin board.

OBJECTIVE

To review the concept of place value with 2-digit numbers

PACING

Level A All
Level B All
Level C All

VOCABULARY

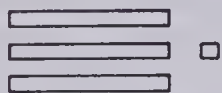
tens, ones, numeral(s)

MATERIALS

Cuisenaire® rods or counting rods or base-ten blocks

SUGGESTIONS

Initial Activity The display on page 2 attempts to show that a number can be represented in many ways (for example, rods and cubes, abacus, place-value chart, expanded or “meaning” form). An effective method to show this representation concretely is to provide students with orange rods (10 cm) and white rods (1 cm) from a Cuisenaire® Set. Ask students to represent various numbers using the rods. For example, “Show me the number 31.”



Some students may show this number with a pile of thirty-one white rods. While this is correct, encourage them to discover that thirty of the white rods may be exchanged for three orange rods. (Suggest that the number be made with the fewest possible rods.) Have students express the number in other ways as suggested in the display. Reverse the procedure and ask students to provide a number for a given representation. For example, “What number does this represent?”



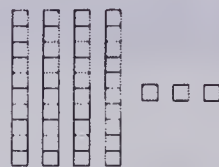
During the initial activity, provide students with ample opportunity to represent numbers concretely and to express the results orally.

ACTIVITIES

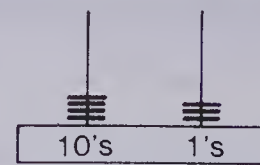
1. A group of children or the whole class might play “Traffic Lights”. One player thinks of a 2-digit number. The others must try to discover that number by using clues: red means “wrong digit”; orange means “right digit, wrong position”; and green means “right digit”. A place-value chart is used to record guesses. The object is for

Two-digit Numbers

These show 43.



4 tens and 3 ones

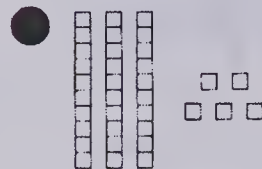


forty-three

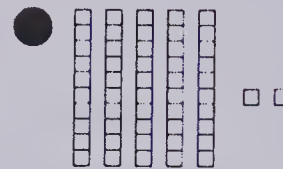
tens	ones
4	3

Exercises

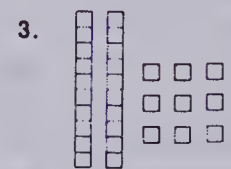
What's my number?



How many tens? ■ 3
How many ones? ■ 5
Number? ■ 35

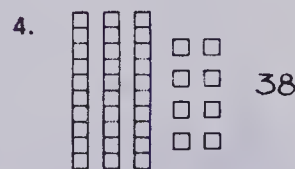


How many tens? ■ 5
How many ones? ■ 2
Number? ■ 52

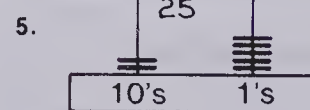


How many tens? ■ 2
How many ones? ■ 9
Number? ■ 29

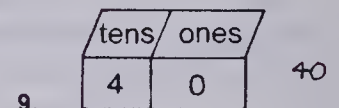
Write numerals to match each.



4. 38



5. 25



6. 52

7. 7 tens and 6 ones

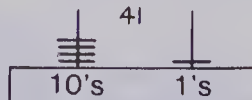
8. 10

9. 40

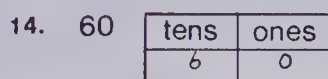
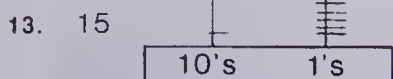
2 Place value, 2 digits

Using the Book You may wish to conduct Exercises 1 to 9 orally, then assign Exercises 10 to 39 as independent work. Exercises 1, 2, 21, 22, 27, and 34 have answers supplied at the back of the book.

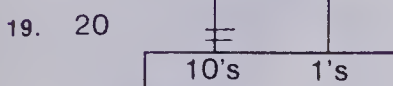
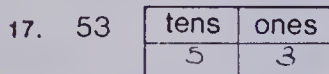
10. sixty-four 64 11. 8 tens and 5 ones. 85 12.



Show these in the manner suggested.



15. 37 (Write in words.) thirty-seven



20. 52 (Write in words.) fifty-two

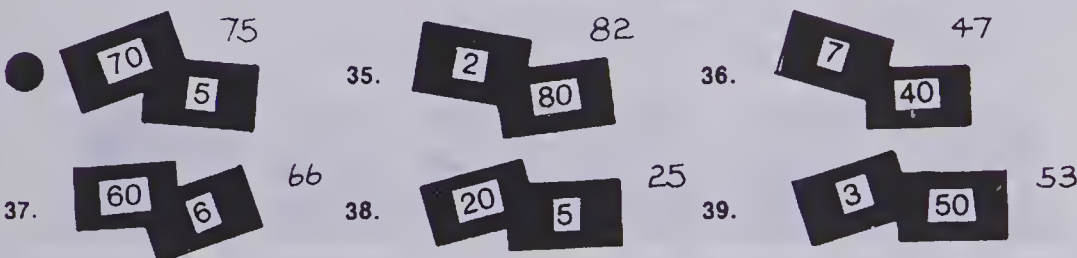
Tell what the 5 means in each numeral.

- 45 5 ones ● 57 5 tens 23. 35 5 ones 24. 50 5 tens 25. 51 5 tens

Write numerals for these.

26. $30 + 5 = 35$ ● $20 + 8 = 28$ 28. $10 + 3 = 13$ 29. $40 + 9 = 49$
 30. $50 + 7 = 57$ 31. $80 + 0 = 80$ 32. $60 + 6 = 66$ 33. $70 + 0 = 70$

Write numerals for these mixed-up cards.



Place value. 2 digits 3

the group to discover the number with the fewest guesses.

Example

Player thinks of the number 72.

		tens	ones
1st guess	1.	3	6
2nd guess	2.	4	7
3rd guess	3.	7	5
4th guess	4.	7	3
5th guess	5.	7	2

1. (red, red) neither digits are correct
 2. (red, orange) ten's digit is incorrect; the 7 is correct digit, but in the wrong position

3. (green, red) the 7 is in correct position, but 5 is incorrect

4. (green, red)

5. (green, green) both are correct!

2. Provide a group with ten's and one's rods and a single die to play the game "Fifty". First player rolls the die and takes the number of one's rods equal to the number showing on the die. The object of the game is to exchange 10 white rods for an orange rod as soon as possible.

Example

	Roll	Total	White	Orange
1.	5	5	5	
2.	3	8	8	
3.	6	14	4	1
4.	•	•	•	•
5.	•	•	•	•

Winner is the first player to accumulate five orange rods or "Fifty".

3. Play the game "Concentration" as described in the Activity Reservoir at the front of the book. Use matching cards similar to these:

- (a)

2 tens and 3 ones

23

- (b)

forty-one

41

- (c)

--

25

EXTRA PRACTICE

Students who require further practice could be given a worksheet like this one.

Complete the chart.

Picture	How many tens?	How many ones?	Number
			54
	7	3	

OBJECTIVE

To use both the written form and the numeric form of ordinal numbers to indicate an object's position in a series

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activities Before beginning page 4, you may wish to demonstrate concretely the other aspect of numbers which tells "which one". Use a line of students at the front of the classroom. Ask, "Who is fifth?", "Who is second?", and so on. Replace the line with other students and ask, "At what place is Susan in the line? Jeff? Barbara?" and so on. You might also use an elevator diagram on the overhead projector or chalkboard and have students indicate the third floor, ninth floor, etc.

Students could be encouraged to think of ways ordinal numbers are used in everyday life (dates — December 25th, team standings — Mudcats are in third place, birthday last celebrated — tenth).

ACTIVITIES

1. Students might enjoy tabulating the standings of school, local, or national teams for the classroom bulletin board. The birthday of each student could be recorded and then decisions made as to who has the first birthday, the second birthday, Children might find interest in exploring "firsts" — the first man on the moon, and those numbers that are considered bad luck — many hotels and office buildings do not indicate a thirteenth floor.

2. Have some students devise series of ordinals and exchange with classmates.

Example

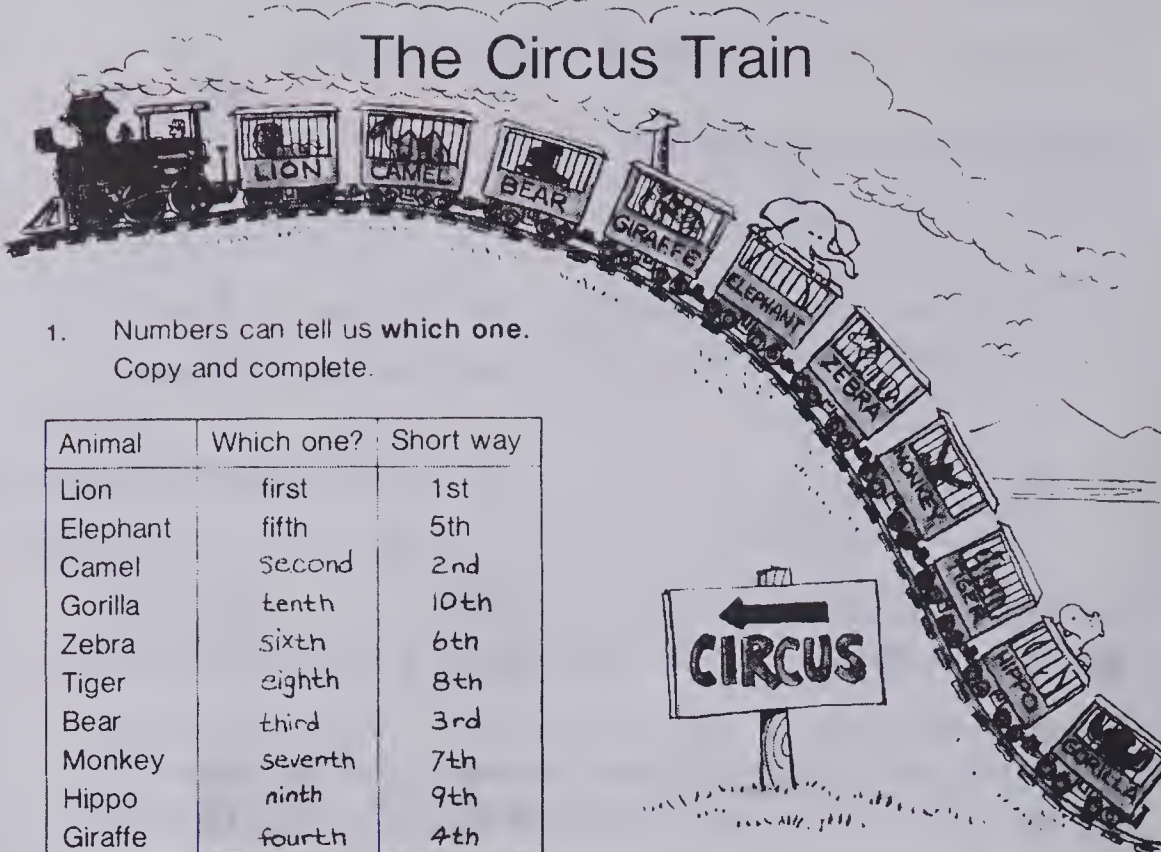
- (a) 43rd, 44th, 45th, __, __, __, __
- (b) 10th, 12th, 14th, __, __, __, __
- (c) 20th, 30th, 40th, __, __, __, __
- (d) fifteenth, sixteenth, seventeenth, __, __, __, __

3. Ask children to match lists of word names for cardinal and ordinal numbers.

Example

- (a) "forty-second" would match "forty-two"
- (b) "thirteenth" would match "thirteen"

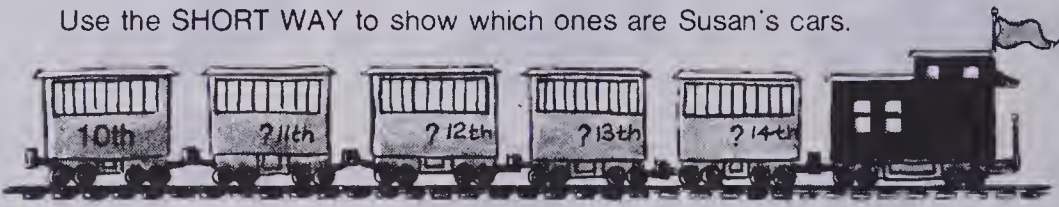
The Circus Train



1. Numbers can tell us **which one**.
Copy and complete.

Animal	Which one?	Short way
Lion	first	1st
Elephant	fifth	5th
Camel	second	2nd
Gorilla	tenth	10th
Zebra	sixth	6th
Tiger	eighth	8th
Bear	third	3rd
Monkey	seventh	7th
Hippo	ninth	9th
Giraffe	fourth	4th

2. Susan wants to add 5 more cars to the train.
Use the **SHORT WAY** to show which ones are Susan's cars.



4 Ordinal numbers

Using the Book Discuss the examples given in Exercise 1, then complete the chart together as a whole class. Write the answers on the chalkboard reinforcing proper pronunciation and spelling. Work cooperatively with Exercise 2.

Adding and Subtracting

sum

$$3 + 5 = 8$$



Three plus five equals eight.

$$\begin{array}{r} 3 \\ + 5 \\ \hline 8 \end{array}$$

$$+ 5$$

$$\hline 8$$

sum

difference

$$8 - 3 = 5$$



difference

$$\begin{array}{r} 8 \\ - 3 \\ \hline 5 \end{array}$$

$$- 3$$

$$\hline 5$$

Eight minus three equals five.

Exercises

1. Find each sum.

$$\bullet \quad 8 + 4 \quad 12$$

$$\bullet \quad 5 + 3 \quad 8$$

$$\bullet \quad 9 + 0 \quad 9$$

$$(d) \quad 6 + 2 \quad 8$$

$$(e) \quad 3 + 0 \quad 3$$

$$(f) \quad 6 + 9 \quad 15$$

$$(g) \quad 8 + 5 \quad 13$$

$$(h) \quad 7 + 9 \quad 16$$

$$(i) \quad 8 + 6 \quad 14$$

$$(j) \quad 10 + 7 \quad 17$$

$$(k) \quad 8 + 8 \quad 16$$

$$(l) \quad 5 + 5 \quad 10$$

2. Find each difference.

$$\bullet \quad 12 - 5 \quad 7$$

$$\bullet \quad 14 - 8 \quad 6$$

$$\bullet \quad 13 - 9 \quad 4$$

$$(d) \quad 4 - 4 \quad 0$$

$$(e) \quad 12 - 6 \quad 6$$

$$(f) \quad 11 - 8 \quad 3$$

$$(g) \quad 9 - 5 \quad 4$$

$$(h) \quad 14 - 7 \quad 7$$

$$(i) \quad 14 - 6 \quad 8$$

$$(j) \quad 12 - 3 \quad 9$$

$$(k) \quad 11 - 7 \quad 4$$

$$(l) \quad 10 - 6 \quad 4$$

3. Calculate.

$$\bullet \quad \begin{array}{r} 7 \\ + 6 \\ \hline 13 \end{array}$$

$$\bullet \quad \begin{array}{r} 8 \\ + 3 \\ \hline 11 \end{array}$$

$$\bullet \quad \begin{array}{r} 9 \\ + 5 \\ \hline 14 \end{array}$$

$$(d) \quad \begin{array}{r} 7 \\ + 8 \\ \hline 15 \end{array}$$

$$(e) \quad \begin{array}{r} 15 \\ - 6 \\ \hline 9 \end{array}$$

$$(f) \quad \begin{array}{r} 18 \\ - 9 \\ \hline 9 \end{array}$$

$$(g) \quad \begin{array}{r} 11 \\ - 3 \\ \hline 8 \end{array}$$

$$(h) \quad \begin{array}{r} 12 \\ - 2 \\ \hline 10 \end{array}$$

$$(i) \quad \begin{array}{r} 2 \\ + 0 \\ \hline 2 \end{array}$$

$$(j) \quad \begin{array}{r} 4 \\ + 1 \\ \hline 5 \end{array}$$

$$(k) \quad \begin{array}{r} 17 \\ - 8 \\ \hline 9 \end{array}$$

$$(l) \quad \begin{array}{r} 15 \\ - 9 \\ \hline 6 \end{array}$$

Addition and subtraction review 5

Using the Book You may wish to use the page as an oral rather than written exercise.

OBJECTIVE

To review simple addition and subtraction facts

PACING

Level A All
Level B All
Level C All

VOCABULARY

sum, difference, calculate, plus, minus, equals, add, subtract

MATERIALS

counters

RELATED AIDS

BFA PROB. SOLVING LAB II — Teaching Card A.

SUGGESTIONS

Initial Activity Use the display to review the following ideas:

- (1) Addition is a "putting together" situation.
- (2) Subtraction is a "taking away" situation.
- (3) Both operations can be shown horizontally or vertically.
- (4) The signs + and - indicate which operation to use.

Reinforce the first and second ideas by using counters. Say, "Make a pile of 5 counters. Add to these 4 more counters. How many counters altogether?" Likewise, "Make a pile of 9 counters. Take away 3 counters. How many counters left?"

ACTIVITIES

1. This would be an appropriate place to develop an on-going drill program, both written and oral. All pupils would benefit from periodic drill; some will require a more intensive program. Four or five minutes of oral drill at the beginning or end of a period will help to sharpen computational skills. Flash cards, brief chalkboard exercises, drill tapes, math games, dice, cards, and spinners are just some of the devices that can be used.

Frequent drill situations that are brief but lively are perhaps more effective than infrequent but lengthy sessions.

2. Play "Concentration" as

described in the Activity Reservoir. Use matching cards, such as:

(a) $14 - 6$ 8

(b) $5 + 7$ 12

3. Play "What's My Rule?"

Provide dittoed sheets or chalkboard examples.

Example

(a)

3	7
8	12
1	5
6	
9	
2	
5	

(b)

12	7
9	4
6	1
14	
7	
8	
10	

Based on the first three in the series, students are asked to discover the rule and complete the tables. [(a) is "add 4" and (b) is "subtract 5".] Allow children to design their own tables and exchange with a classmate.

EXTRA PRACTICE

Provide some oral drill where students are expected to write (or say) the final answer.

Say: (a) "Add 3 to 6."

(b) "Subtract 2 from 15."

(c) "Add 7 to 5."

etc.

OBJECTIVE

To add two 2-digit whole numbers without regrouping

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

chart form, short form

MATERIALS

orange and white rods or base-ten blocks

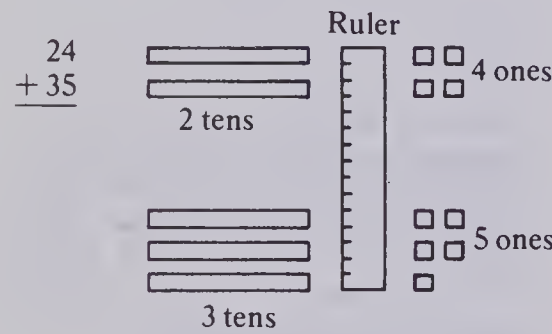
RELATED AIDS

BFA COMPLAB II — 2.
BFA PROB. SOLVING LAB II — 1, 161, 201.

SUGGESTIONS

Initial Activity Your method of introducing this lesson will depend on the past experiences of the class. If they have had practice adding 2-digit numbers, you may wish to start with a chalkboard review using examples similar to the one in the display. Otherwise, it would be appropriate to start with an activity using concrete materials. Concrete experiences are important for children in order to help them develop understanding of arithmetic operations. Below are 3 suggested steps leading from concrete to abstract.

(1) Concrete form: Provide students with orange and white rods or number blocks and ask them to represent an addition question written on the chalkboard.



The ruler is used to separate the two kinds of units (ones and tens). It demonstrates the necessity of adding only like units. By moving the rods

(Continued on page 11)

The Tree Farm

Kim planted 14 maple trees.
She also planted 25 pine trees.
How many trees did Kim plant altogether?



We can use the chart form.

	tens	ones
+	1 2	4 5

3 tens and 9 ones = 39

Kim planted 39 trees altogether.

Here's a short form.

Add ones.	Add tens.
14 + 25 — 9	14 + 25 — 39

Exercises

Add using the chart form.

● 34 + 21 — 55	● 45 + 22 — 67	3. 70 + 26 — 96	4. 52 + 34 — 86	5. 83 + 14 — 97
-------------------------	-------------------------	--------------------------	--------------------------	--------------------------

Add using the short form.

● 53 + 42 — 95	● 60 + 37 — 97	8. 26 + 21 — 47	9. 47 + 12 — 59	10. 25 + 41 — 66
-------------------------	-------------------------	--------------------------	--------------------------	---------------------------

- 11. 16 apple trees.
22 peach trees.
How many trees altogether? 38
- 12. 42 maple trees.
36 oak trees.
How many trees altogether? 78

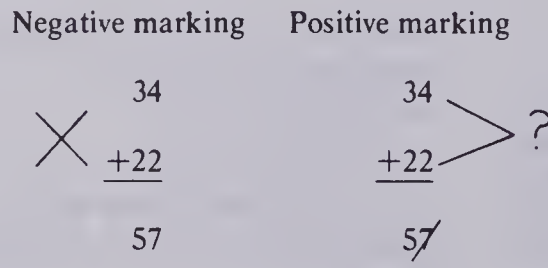
6 Adding 2-digit numbers no regrouping

Using the Book Have students carefully copy the questions in their notebooks. As you move about the room, look for questions copied incorrectly. This may indicate carelessness on the part of a student, or may indicate a possible perceptual problem. Some students may have copied incorrectly because of immature hand-eye coordination. If the problems of perception and coordination persist, it would be advisable to call on the services of a remedial specialist.

During the early stages of a mathematics program, it is appropriate to establish a consistent format for the marking and correction of errors.

Example

MARKING



Negative marking only tells the student that he/she has made an error. Positive marking leads the student directly to the source of the error. Teachers who use positive marking often use blue or green marking pencils rather than red.

CORRECTIONS

Many teachers have students rewrite any incorrect questions at the end of the exercise under the title "Corrections". Students who have a great many errors would profit from reteaching before being asked to rewrite the questions.

Whatever method you use, be consistent. Students should be aware of your expectations.

Sky Car



The sky car made 25 trips in the morning. Add: 25
It made 37 trips in the afternoon. + 37
How many trips did it make altogether?

Here's a short form.

Chart form.

tens	ones
2	5
3	7

5 tens and 12 ones
= 6 tens and 2 ones
= 62.

The sky car made 62 trips altogether.

(a) Add ones. (b) Add tens.

$$\begin{array}{r} 25 \\ + 37 \\ \hline 2 \end{array}$$

7 - 5 = 12

$$\begin{array}{r} 25 \\ + 37 \\ \hline 62 \end{array}$$

Exercises

Rename the following.

- 5 tens and 14 = 6 tens and 4 ones
- 4 tens and 15 = 5 tens and 5 ones
- 7 tens and 16 = 8 tens and 6 ones
- 2 tens and 18 = 3 tens and 8 ones

Add using the chart form.

$$\begin{array}{r} 27 \\ + 54 \\ \hline 81 \end{array}$$

$$\begin{array}{r} 58 \\ + 26 \\ \hline 84 \end{array}$$

$$\begin{array}{r} 45 \\ + 28 \\ \hline 73 \end{array}$$

$$\begin{array}{r} 36 \\ + 39 \\ \hline 75 \end{array}$$

$$\begin{array}{r} 72 \\ + 19 \\ \hline 91 \end{array}$$

Add using the short form.

$$\begin{array}{r} 37 \\ + 28 \\ \hline 65 \end{array}$$

$$\begin{array}{r} 64 \\ + 29 \\ \hline 93 \end{array}$$

$$\begin{array}{r} 48 \\ + 28 \\ \hline 76 \end{array}$$

$$\begin{array}{r} 26 \\ + 47 \\ \hline 73 \end{array}$$

$$\begin{array}{r} 59 \\ + 21 \\ \hline 80 \end{array}$$

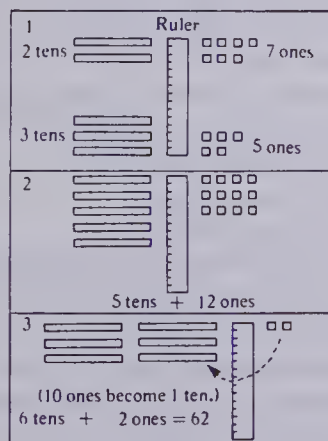
Adding 2-digit numbers, regrouping 7

Using the Book Work together with students on Exercises 1 to 4, then allow them to work on it independently.

SUGGESTIONS

Initial Activity You may wish to capitalize on student experiences with concrete materials from the previous lesson. The rods or blocks show with great clarity the process of renaming (regrouping). Use the following 3 steps.

- Concrete form



Concrete examples can lead directly to the written chart and short forms.

- Chart form

$$\begin{array}{r} \text{tens} & \text{ones} \\ 2 & 5 \\ 3 & 7 \\ \hline \end{array} \rightarrow \begin{array}{r} 27 \\ + 35 \\ \hline 62 \end{array}$$

5 tens and 12 ones
= 6 tens and 2 ones
= 62

Allow students time to work with several concrete examples, then move to the chart and short forms as demonstrated in Steps 2 and 3.

The regrouping of the 1 ten in the short form is indicated by placement of a "1" in the ten's column. This provides a reminder that regrouping has occurred and that this must be taken into account when the ten's column is added. Encourage students, when you feel they are ready, to perform this placement mentally.

ACTIVITIES

- Introduce students to addition grids.

OBJECTIVE

To add two 2-digit numbers with regrouping

PACING

Level A All
Level B All
Level C All

VOCABULARY

rename (regroup)

MATERIALS

orange and white rods or base-ten blocks

RELATED AIDS

HMS — DM1.

BFA COMP LAB II — 4.

BFA PROB. SOLVING LAB II — 2, 5, 13, 162.

Encourage them to create their own and exchange with a classmate.

Example

+	7	11	21	6
16				
3		14		
12				
10				16

"Copy and complete."

2. If some students have difficulty with the idea of regrouping, provide activity sheets or cards similar to these:

A. Complete.

- 4 + 8 = 1 ten + 2 ones
- 5 + 9 = 1 ten + 4 ones
- 7 + 9 = 1 ten + 6 ones

B. Rename to show more tens.

1.	2.
$\begin{array}{r} \text{tens} & \text{ones} \\ 6 & 12 \\ \hline \end{array}$	$\begin{array}{r} \text{tens} & \text{ones} \\ 3 & 14 \\ \hline \end{array}$

C. Complete the chart.

Expand	Rename	Number
7 tens + 13 ones	8 tens + 3 ones	83
4 tens + 18 ones		
6 tens + 15 ones		

OBJECTIVE

To indicate: (a) the main idea; (b) what is being asked; (c) the important facts; and (d) the appropriate operation upon reading a word problem

PACING

Level A All
Level B All
Level C All

VOCABULARY

important, tournament, Ms.

SUGGESTIONS

Initial Activity This lesson is designed to provide students with some initial skills for attacking word problems. While you may expect students to solve each problem, the more important skill here is to find answers to Professor Q's questions.

Write two or three sample problems on the chalkboard (or overhead projector). Have students use the Professor's four questions in the display as a guide to help them find the answers. Whether you decide to make this exercise oral or written, encourage students to respond in a brief manner—directly and to the point.

ACTIVITIES

1. Often, the most difficult of Professor Q's questions is "What should you do?" This activity gives children the much needed practice in choosing the correct operation.

Prepare four envelopes, each marked with its own operations symbol:



Print on cards, or cut out from old textbooks, one-step word problems. The student is required to read a problem card and place it in an appropriate envelope. When complete, have another student check for accuracy. An activity such as this can be used with student-generated word problems, later in the program.

2. Real-life problems often contain too much information or not enough. Consider developing these two ideas as an extension, either as a follow-up to the lesson or as a separate lesson at a later time. These two questions then, could be added to the student's repertoire.

Professor Q

Bob's dog just had a litter of puppies.
5 puppies were white. 3 puppies were black.
How many puppies were there altogether?



Professor Q asks questions.

Bob looks for answers.

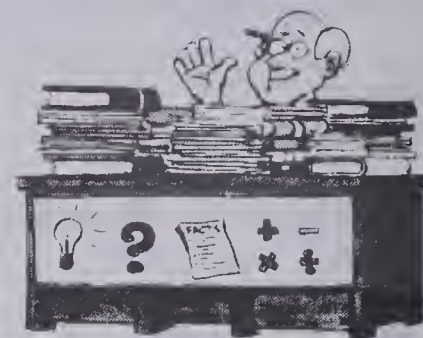
Questions	Answers
1. What is the question about?	Puppies
2. What is being asked?	How many puppies?
3. What are the important facts?	5 white puppies and 3 black puppies
4. What should you do?	Add

Exercises

Read each mini-story.

Write answers to Professor Q's four questions.

- John and Barry are saving hockey cards.
John has 36 cards.
Barry has 42 cards.
How many hockey cards do they have altogether? 78
- Susan and Karen played in the Checker Tournament.
Susan won 9 games.
Karen won 19 games.
How many more has Karen won than Susan? 10
- Mr. Foster drives 4 km.
Ms. Bick drives 6 km.
How much farther does Ms. Bick drive than Mr. Foster? 2km



8 Reading word problems

Using the Book If you wish to conduct problems 1 to 3 as a written exercise, remind students that their responses should be brief.

"What information is unnecessary?"

Some students are saving hockey cards.

John has 36 cards.

Sandy has 42 cards.

Barry has 44 cards.

Brenda has 38 cards.

How many cards do John and

Brenda have altogether?

"What information is missing?"

Bob and John are saving hockey cards.

John has 36 cards.

How many more cards does Bob have than John?

Here again, the important point is to have students answer the Professor's questions. Then you may wish to encourage students to find a numerical solution to the problem. In order that students examine each problem critically, include cases where information is neither missing nor unnecessary. In cases where information is missing, you might provide a data sheet which contains not only the missing data but also irrelevant data, or you might encourage students to insert their own data into the problem so that they can find a numerical solution.

Number Sentences

$8 + \blacksquare = 14$ is a **number sentence**.

We can replace \blacksquare with a number to make the sentence **true**.

$$8 + 6 = 14$$

Exercises

Which are true? Ex 1, 3, 4, and 5

- \bullet $4 + 7 = 11$ \bullet $15 - 5 = 8$ \bullet $7 - 3 = 4$
 4. $4 + 5 < 10$ 5. $5 + 6 > 10$ 6. $2 + 7 = 10$

Make these number sentences true.

- \bullet $9 + 7 = \blacksquare$ 16
 10. $3 + \blacksquare = 8$
 13. $3 + 2 = \blacksquare + 1$
 16. $3 + 7 = \blacksquare + 5$
 19. $14 - \blacksquare = 3$
 22. $25 - \blacksquare = 6$
 25. $9 + 7 = 20 - \blacksquare$
 ★ 28. $17 - 4 < \blacksquare$
 ★ 31. $14 - \blacksquare < 12$
- \bullet $\blacksquare = 7 - 3$
 11. $7 + 6 = \blacksquare$ 13
 14. $8 + \blacksquare = 4 + 7$
 17. $9 + \blacksquare = 16$
 20. $18 = \blacksquare + 10$
 23. $\blacksquare + 4 = 8 + 8$
 ★ 26. $4 + 5 > \blacksquare$
 ★ 29. $6 + \blacksquare < 9$
 ★ 32. $\blacksquare + 12 < 15$
- \bullet $15 - \blacksquare = 7$
 12. $14 - 8 = \blacksquare$ 6
 15. $12 = 5 + \blacksquare$ 7
 18. $\blacksquare - 6 = 12$
 21. $11 + 6 = \blacksquare$ 17
 24. $\blacksquare - 6 = 14$
 ★ 27. $5 + 9 < \blacksquare$ 15 or 16...
 ★ 30. $2 + \blacksquare > 4$ 3 or 4..
 ★ 33. $8 + \blacksquare < 9$

Open number sentences 9

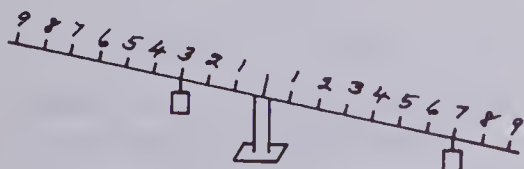
Using the Book No formal method for solving equations (e.g., inverse statements) is intended for this page. Rather, students should be encouraged to find solutions by inspection (or trial and error).

Exercises 26-33 are included for those students who would benefit from exploring inequalities. Reinforce the idea that often more than one number is required to make the inequality true.

Example $3 + 5 > \blacksquare$ $\blacksquare = (0, 1, 2, \dots, 7)$ $6 - 4 < \blacksquare$ $\blacksquare = (3, 4, 5, \dots)$

ACTIVITIES

1. Allow the children, in pairs, to use the math balance as mentioned under Initial Activity. One player uses the balance to demonstrate part of a number sentence, e.g.,



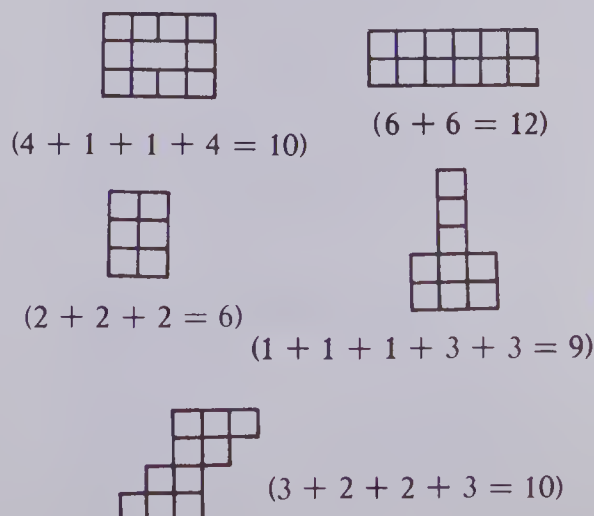
Second player must write the appropriate true number sentence, e.g., $3 + 4 = 7$. First player uses the balance to check. Players switch roles. Winner is the player with the most correct number sentences after 7 tries.

2. Have students write true number sentences based on the number

of squares in shapes drawn on grid paper.

Example

Try shapes similar to these.



OBJECTIVE

To make true number sentences

PACING

Level A 1-21
Level B 1-9, 13-25
Level C 1-18, 26-33

VOCABULARY

number sentence(s), true (equation, inequation)

MATERIALS

math balance

SUGGESTIONS

Initial Activity A homemade or commercial math balance can be effectively used to demonstrate the idea of equality.



$$3 + 5 = 8$$

True

It also indicates when a number sentence is not true.

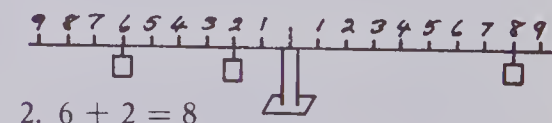


$$2 + 7 = 6$$

The balance also demonstrates quite effectively that, in order to make an open number sentence true, we must replace the box with the correct number.



$$1 + 6 = 8$$



$$6 + 2 = 8$$

3. Place this grid on the board. Say, "Find the 24 pairs of numbers that add to 50."

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49

$49 + 1 = 50$
 $48 + 2 = 50$
 $47 + 3 = 50$
 and so on.

OBJECTIVE
To solve simple word problems by writing number sentences

PACING
Level A All
Level B All
Level C All

VOCABULARY
problem(s), solving (solve), fact(s)

BACKGROUND
See the Chapter Overview.

SUGGESTIONS
Initial Activity Place a few simple word problems on the chalkboard. These could be derived from simple classroom data.
Example
(a) There are 14 boys and 17 girls in our classroom. How many students are there altogether?
(b) There are 8 containers of red paint and 15 containers of green paint in the cupboard. How many containers of paint altogether?
(c) According to our "Pet Survey", students in our class have 11 dogs and 9 cats. How many pets does our class have altogether?

Using the problems, work with the students to develop the problem-solving process using Professor Q's questions and statements. Develop the format for recording the process (e.g., Formats 1, 2, or 3).

Some students may wonder about what constitutes "necessary" computation. A basic fact should not require rewriting in the computation column. It could be solved mentally.

Example
 $12 - 5 = \blacksquare$
 $12 - 5 = 7$

More difficult expressions, however, may require computation.


Example

$143 - 78 = \blacksquare$	Computation
$143 - 78 = 65$	
$\begin{array}{r} 143 \\ - 78 \\ \hline 65 \end{array}$	


ACTIVITIES
1. Students might enjoy compiling their own profile for Professor Q from his picture on page 11.
Example
(a) When was he born? How old is he now?
(b) Where was he born?
(c) What powers do you think he has?

Solving Problems





Brian has 12 cards.



Mary has 5 cards.



How many more cards does Brian have than Mary?
Find answers to Professor Q's four questions.

1. What is the question about?	   	Cards.
2. What is being asked?		How many more does Brian have than Mary?
3. What are the important facts?		Brian has 12, Mary has 5.
4. What should you do?		Subtract.

Write a number sentence to solve the problem.
 $12 - 5 = 7$
Brian has 7 more cards than Mary.

Exercises

● Uva and Julie are collecting stories about horses.
Uva has 6 stories.
Julie has 8 stories.
How many stories do they have altogether?
(a) Answer Professor Q's four questions.
(b) Write a number sentence to fit the problem. $6 + 8 = 14$
(c) How many stories do they have altogether? 14

Using the Book Work together with students on Exercise 1, then permit students to work independently on Exercises 2-7.

For each of the following:

- Answer Professor Q's four questions.
- Write a number sentence to fit the problem.
- Answer the problem.

- Fred collects toy cars.

He had 27 cars.

Then he bought 4 more. $27 + 4 = 31$

How many does Fred have now? 31

- Twenty-four crows sat on a fence.

Eighteen more joined them on the fence $24 + 18 = 42$

How many crows altogether? 42

- There are 16 fish in the tank.

Sharon brought 7 more. $16 + 7 = 23$

How many fish are there altogether? 23

- There are 15 books about birds in the library.

One class signed out 7 of them. $15 - 7 = 8$

How many bird books are left in the library? 8

- Betty collected 25 shells along the beach.

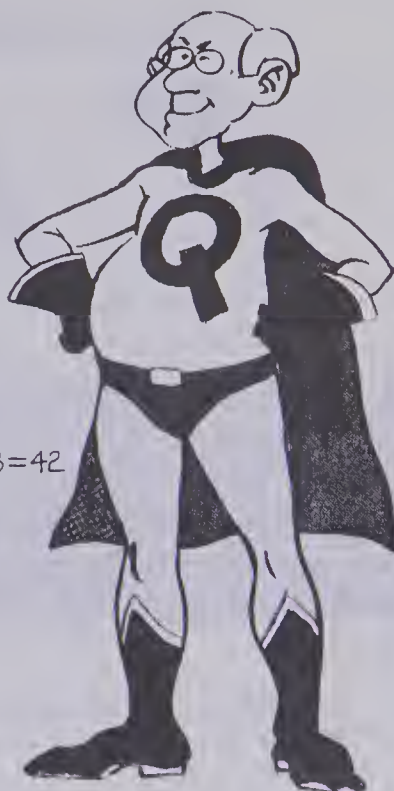
Her brother collected 18 shells. $25 + 18 = 43$

How many shells were collected altogether? 43

- Bob delivers newspapers.

He has 52 customers in one apartment building and 37 customers in another. $52 + 37 = 89$

How many customers does he have in the 2 buildings? 89



- Did he attend university? Where? What degrees?

- Is he married? If so, what would Mrs. Q look like?

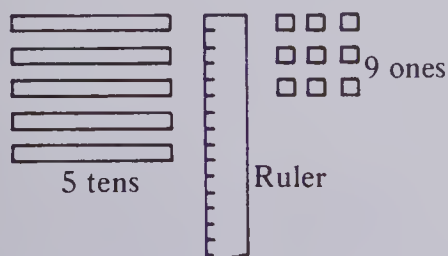
2. Now would be an appropriate time to plan to make problem solving an on-going part of your mathematics program. Problem-solving pages in this text can be supplemented with teacher- and pupil-made problems taken from telephone books, catalogues, newspapers, magazines, books about world records, facts and lists, almanacs, and so forth.

Problem-solving skills can be maintained by having a "Problem of the Day" or "Problem of the Week". Please refer to "Problems of the Week" as outlined at the front of this book. Consider using a "Problem-Solving Centre" which includes puzzles, "brain-twisters", and other activities.

- See the Activities for page 9.

(Continued from page 6)

students can demonstrate the process of addition or "putting together".

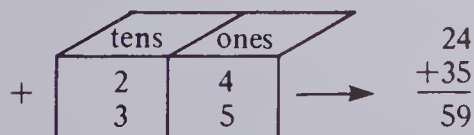


5 tens and 9 ones equal 59.

Concrete examples can lead directly to the written chart and short forms.

(2) Chart form

(3) Short form



5 tens and 9 ones = 59

ACTIVITIES

- See the Fact-Folder idea in the Activity Reservoir.

2. Prepare 15 or so cards showing computations as described on this page (i.e., 2-digit addition, no regrouping). Be sure that each card includes the sum. Add a twist by ensuring approximately one half of the cards are incorrect. The object of this activity is to sort the cards in containers or envelopes labelled "Good Work" and "Oops". When completed, the child gives the containers to a classmate to check, and reshuffle.

EXTRA PRACTICE

- $24 + 13$
- $35 + 21$
- $16 + 22$
- $40 + 15$
- $52 + 35$
- $46 + 20$
- $28 + 11$
- $63 + 24$
- $18 + 30$
- $55 + 44$

Inspector Hemlock's Discovery

$$6 + 8 + 3 = \blacksquare ??$$

() mean "Do me first!"

Inspector Hemlock discovered that: $(6 + 8) + 3 \longrightarrow 14 + 3 = 17$

He also discovered that: $6 + (8 + 3) \longrightarrow 6 + 11 = 17$

Can you explain Inspector Hemlock's discovery
in your own words?

The grouping property of addition says:

Changing the grouping of the addends does not change the sum.

Exercises

1. Find the sums.

● $(4 + 5) + 6 = 15$

(b) $(12 + 7) + 8 = 27$

$4 + (5 + 6) = 15$

$12 + (7 + 8) = 27$

What did you discover about the sums? The sums are the same

2. Copy and complete.

Since I know	Then I know
$(7 + 6) + 2 = 15$	$7 + (6 + 2) = \blacksquare 15$
$(3 + 8) + 6 = 17$	$3 + (8 + 6) = \blacksquare 17$
$(4 + 7) + 5 = \blacksquare 16$	$4 + (7 + 5) = \blacksquare 16$
$(8 + 1) + 9 = \blacksquare 18$	$8 + (1 + 9) = \blacksquare 18$
$(3 + 6) + 2 = \blacksquare 11$	$3 + (6 + 2) = \blacksquare 11$
$(10 + 4) + 6 = \blacksquare 20$	$10 + (4 + 6) = \blacksquare 20$

3 addends associative property 13

Using the Book Work together on Exercise 1 to confirm the conclusion reached in the Initial Activity, then assign Exercise 2 for independent work.

OBJECTIVE

To develop the grouping (associative) property of addition

PACING

Level A All

Level B All

Level C All

VOCABULARY

grouping property, brackets (parentheses)

BACKGROUND

As noted in the previous lesson, the emphasis should not be on rote memorization of a property or its algebraic representation, but rather on its usefulness. In the number expression $(7 + 6) + 4$, it is probably easier to rewrite it as $7 + (6 + 4)$ giving us the benefit of an easier fact (combination of 10) to add.

Secondly, if a student is faced with a difficult or unknown fact, such as $7 + 6$, the student can think of it as $7 + (3 + 3)$, then as $(7 + 3) + 3$, which again uses the combination of 10, e.g., $(7 + 3) + 3 = 10 + 3$ or 13.

SUGGESTIONS

Initial Activity Use pairs of chalkboard examples similar to those in the display. Ask, "How is each pair the same, different?"

Elicit from students the conclusion that changing the grouping of the addends does not affect the sum.

Be sure that students understand that the parentheses (brackets) indicate "Do me first!"

ACTIVITIES

1. Play the game "Toss 'N' Tell" as described in the Activity Reservoir at the front of the book.

2. Remove the face cards from a deck of cards. Each student in the group draws three cards and records the result using two number expressions and brackets.

Example

Cards: 5, 8, 3

(1) $(5 + 8) + 3 = 16$

(2) $5 + (8 + 3) = 16$

3. Place this grid ("Hidden Addition") on the board or on a dittoed sheet. Encourage students to find as many addition statements as they can by adding horizontally and vertically.

"Hidden Addition"

4	7	11	36	26
63	7	9	15	4
6	14	20	10	30
19	50	29	25	54

Example

$4 + 7 = 11$

$11 + 9 = 20$

$26 + 4 = 30$

and so on.

OBJECTIVE

To apply the order and grouping properties in addition of three addends

PACING

Level A All
Level B All
Level C All

RELATED AIDS

BFA COMP LAB II—1.

BACKGROUND

Addition is a binary operation; that is, we can only add two numbers at a time. When dealing with 3 or more addends, the order and grouping properties show that the addends can be thought of in any order of any groups without changing the sum. Quite often this gives us the opportunity to look for "combinations of 10".

Example

The expression $2 + 7 + 3$ can be thought of as $2 + (7 + 3)$ which leads to $10 + 2$ or 12 (making use of the combination of 10).

SUGGESTIONS

Initial Activity Use series of 3 addends for mental games. Encourage students to note that, where they are present, "combinations of 10" make addition easier.

ACTIVITIES

1. Remove the face cards from a deck of playing cards and play the game "Highest Sum". Dealer deals 3 cards to each player. Player with the greatest sum wins that round and the deal. Play stops after a predetermined time or after a certain number of wins by an individual player.

2. Have children make their own addition questions. Provide general rules: "Make an addition question using 3 single-digit addends so that the sum is:

- exactly 11
- less than 15
- greater than 24
- between 15 and 20."

3. Introduce students to "Magic Squares" where the sums horizontally, vertically and diagonally are the same.

Example

8	1	6
3	5	7
4	9	2

The "magic sum" here is 15.

(16)	2	12
(6)	(10)	14
8	(18)	4

(Magic Sum is 30.)

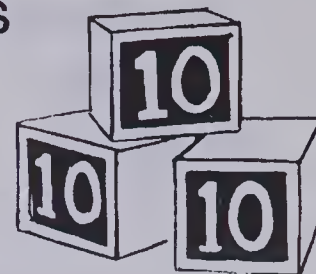
24	3	18
(9)	15	(21)
12	(27)	(6)

(Magic Sum is 45.)

Three Addends

- Sandy likes to find "tens" to make addition easier. How would Sandy do this question?

$$(2 + 7) + 3 = \boxed{12} \text{ or } 2 + (7 + 3) = \boxed{12}$$



Add these.

- 9 + (2 + 8) = $\boxed{19}$
- 5 + 5 + 7 = $\boxed{17}$
- 7 + 6 + 4 = $\boxed{17}$
- 1 + 9 + 5 = $\boxed{15}$
- 3 + 7 + 8 = $\boxed{18}$
- 5 + 8 + 2 = $\boxed{15}$
- 4 + 7 + 3 = $\boxed{14}$
- 6 + 4 + 6 = $\boxed{16}$
- 2 + 9 + 8 = $\boxed{19}$

11. Sandy adds:

$$\begin{array}{r} 2 \\ 8 \\ +4 \\ \hline 14 \end{array}$$

Murray adds:

$$\begin{array}{r} 2 \\ 8 \\ +4 \\ \hline 14 \end{array}$$

- What is Sandy's sum? 14
- What is Murray's sum? 14
- Explain how each found the sum.
- Which way do you like better? Why?
Sandy's addition because finding "tens" makes addition easier.

Add.

- 8
2
+7

17
- 9
6
+4

19
- 3
7
+5

15
- 15. 3
9
+1

13
- 16. 5
5
+4

14
- 17. 4
6
+7

17
- 18. 1
9
+6

16
- 19. 5
2
+8

15
- 20. 7
4
+5

16
- 21. 9
3
+6

18

14 3 addends

Using the Book Assign Exercises 1-10. Upon completion, ask students to describe how they "grouped" to make addition easier. Discuss Exercise 11. reinforcing the "facts for 10" aspect, then assign Exercises 12-21.

Ask students to copy and complete these two magic squares, and to find the magic sum. (Answers are given in brackets.)

A Card Challenge!



Susan shows two ways all the cards can be used to show addition.

(a) $(3 + 4) + 2 + 7 = 16$

(b) $(3 + 7) + 4 + 2 = 16$

Can you find other ways?

Exercises

Bob, Brenda, and Ron added $6 + 3 + 4 + 7$.

Bob:

$$\begin{array}{r} 6 \\ 3 \\ 4 \\ + 7 \\ \hline \end{array} \begin{array}{l} \nearrow 9 \\ \nearrow 13 \\ \nearrow 20 \end{array}$$

Brenda:

$$\begin{array}{r} 6 \\ 3 \\ 4 \\ + 7 \\ \hline \end{array} \begin{array}{l} 20 \\ 14 \\ 11 \end{array}$$

Ron:

$$\begin{array}{r} 6 \\ 3 \\ 4 \\ + 7 \\ \hline \end{array} \begin{array}{l} \nearrow 10 \\ \nearrow 10 \\ \nearrow 20 \end{array}$$

1. Tell how each one added.
2. What do you notice about the sums? *The sums are the same.*

Add.

●	4	●	4	5.	9	6.	4	7.	9	8.	8
	9		5		4		5		8		1
	6		6		7		6		7		4
	+1		+5		+3		+7		+1		+5
	<hr/> 20		<hr/> 20		<hr/> 23		<hr/> 22		<hr/> 25		<hr/> 18

4 addends 15

OBJECTIVE

To apply the order and grouping properties in addition of 4 addends

PACING

Level A All
Level B All
Level C All

MATERIALS

number cards

RELATED AIDS

BFA COMP LAB II — 1.

SUGGESTIONS

Initial Activity Briefly review the order and grouping properties of addition. Construct individual student number cards as illustrated in the display (or construct one set for the overhead projector).

Using the Book Ask students to list ways to show addition different than Susan's. You may want to do Exercises 1 and 2 orally with the students. While Bob and Brenda have the correct sum, Ron has made use of the "facts for 10". (Students are not expected to write the partial sums, but rather find them mentally.)

ACTIVITIES

1. A 4-function calculator with an 8-digit display can be used to generate addition questions.
 - (a) Enter 8 digits at random or in series:
Example 1, 2, 3, 4, 5, 6, 7, 8
 - (b) Divide by the greatest digit:
 $12\,345\,678 \div 8 = 1\,543\,209.7$
 - (c) Use the first four digits for one question, the second four for another question. (This exercise could be oral or written.)
 - (d) Repeat Step (b) for each new set:
 $1\,543\,209.7 \div 9 = 171\,467.74$,

$$171\,467.74 \div 7 = 24\,495.391$$

(Note that "facts for 10" are not generated in every set. As in "real life", these facts occur occasionally.)

When a number of zeros begin to appear, simply erase the display and enter another series of eight digits.

2. Play "Highest Sum" as described in the Activities on page 14. Deal 4 cards to each player this time.

3. Have children make their own addition questions. Provide general rules: "Make an addition question using 4 single-digit addends so that the sum is:

- (a) exactly 29
- (b) less than 20
- (c) greater than 32
- (d) between 18 and 21."

EXTRA PRACTICE

Provide extra practice using extension facts. Ask students to note and discuss the patterns.

Example

- | | |
|-------------------------|-------------------------|
| (a) $3 + 5 = 8$ | (b) $8 + 4 = 12$ |
| $13 + 5 = \blacksquare$ | $18 + 4 = \blacksquare$ |
| $23 + 5 = \blacksquare$ | $28 + 4 = \blacksquare$ |
| $33 + 5 = \blacksquare$ | $38 + 4 = \blacksquare$ |

OBJECTIVE

To extend place-value skills to the hundreds

PACING

Level A All
Level B All
Level C All

VOCABULARY

hundred(s), numeral

MATERIALS

base-ten blocks including layers, rods, and unit cubes

RELATED AIDS

HMS — DM2.

SUGGESTIONS

Initial Activity Lead students to discover the number attributes of each model, some of which are presented in the first part of this page.

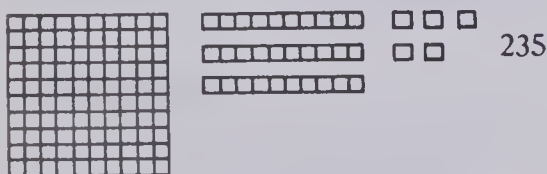
Example

layer → 100 units
rod → 10 units
cube → 1 unit

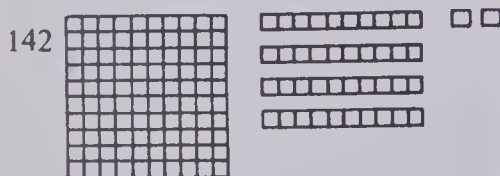
Provide the opportunity for students to translate from physical models to numerals and vice versa.

Example

(a) "What number is shown here?"



(b) "Show the number 142."

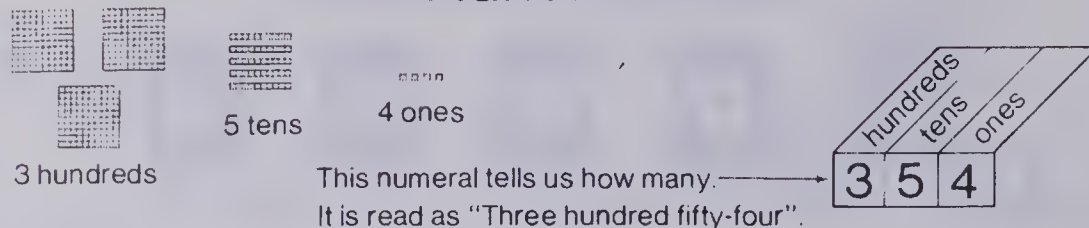


Relate both models and numerals to the place-value chart, thus emphasizing the relationship between a particular model and each digit's place value. Also, provide sufficient practice in reading numbers.

ACTIVITIES

1. Play "The P.V. Game" as described in the Activity Reservoir.
2. Provide challenges similar to the following:

Hundreds



Exercises

Write numerals for these.

1. 25
2. 308
3. 140

ANSWERS

11. four hundred twenty-eight
12. nine hundred five
13. seven hundred thirteen
14. six hundred thirty
15. two hundred ninety-nine

Write numerals for these.

- 5 hundreds 0 tens 503 3 ones
- 4 hundreds 8 tens 485 5 ones
- 2 hundreds 6 tens 260 0 ones

Write numerals for these.

- seven hundred eighty-two 782
- two hundred fifty 250
- six hundred seventeen 617
- three hundred four 304

Write these in words.

- 428
- 905
- 713
- 630
- 299

16 Place value 3 digits

Using the Book Students should be able to work through the exercises independently.

"Write a 3-digit number with 6 in the ten's place."
"Write the greatest 3-digit number with a 4 in the hundred's place."
"Write the least 3-digit number with a 3 in the one's place."

3. Have students construct and play the game "999".

Cards: 9 cards with 100, 200, 300, ..., 900, one on each card
9 cards with 10, 20, 30, ..., 90, one on each card
9 cards with 1, 2, 3, ..., 9, one on each card
3 cards with 0 (zero), one on each card

Players: 2-4 players

Play: Dealer deals 3 cards face down to each player. The remaining cards are placed face down to form a "Draw Pile". Each player in turn draws the top card from the "Draw Pile" and discards a card, putting it face down in a "Discard Pile".

The object of the game is to make "999" (i.e., $900 + 90 + 9$) or the greatest 3-digit number closest to it within a certain time, or after a certain number of rounds.

Variations: (a) First person to make a number with three identical digits wins, e.g., 777 ($700 + 70 + 7$).

(b) First person to make the least 3-digit number wins, e.g., 100 ($100 + 0 + 0$).

EXTRA PRACTICE

Place-value skills could be further consolidated by using exercises similar to these.

1. Write the numeral.
 - (a) $600 + 0 + 4 = 604$
 - (b) $500 + 30 + 2 = \blacksquare$
2. Expand.
 - (a) $487 = 400 + 80 + 7$
 - (b) $903 = \blacksquare$
3. Unscramble, then write the numeral.
 - (a) 4 ones + 0 hundreds + 5 tens = 54
 - (b) 0 tens + 3 ones + 8 hundreds = \blacksquare

Parking

Max counts the number of cars using the City Parking Lot.

325 cars in the morning.
414 cars in the afternoon.
How many cars altogether?



Max uses a short form.

Add ones.

$$\begin{array}{r} 325 \\ + 414 \\ \hline 9 \end{array}$$

Add tens.

$$\begin{array}{r} 325 \\ + 414 \\ \hline 39 \end{array}$$

Add hundreds

$$\begin{array}{r} 325 \\ + 414 \\ \hline 739 \end{array}$$

Max counted 739 cars altogether.

Exercises

Add to find how many cars. Use the short form.

1. $\begin{array}{r} 253 \\ + 432 \\ \hline 685 \end{array}$	2. $\begin{array}{r} 306 \\ + 342 \\ \hline 648 \end{array}$	3. $\begin{array}{r} 552 \\ + 246 \\ \hline 798 \end{array}$	4. $\begin{array}{r} 240 \\ + 328 \\ \hline 568 \end{array}$	5. $\begin{array}{r} 342 \\ + 525 \\ \hline 867 \end{array}$
6. $\begin{array}{r} 641 \\ + 206 \\ \hline 847 \end{array}$	7. $\begin{array}{r} 432 \\ + 360 \\ \hline 792 \end{array}$	8. $\begin{array}{r} 180 \\ + 210 \\ \hline 390 \end{array}$	9. $\begin{array}{r} 336 \\ + 243 \\ \hline 579 \end{array}$	10. $\begin{array}{r} 620 \\ + 149 \\ \hline 769 \end{array}$
11. $\begin{array}{r} 785 \\ + 113 \\ \hline 898 \end{array}$	12. $\begin{array}{r} 300 \\ + 200 \\ \hline 500 \end{array}$	13. $\begin{array}{r} 237 \\ + 230 \\ \hline 467 \end{array}$	14. $\begin{array}{r} 694 \\ + 304 \\ \hline 998 \end{array}$	15. $\begin{array}{r} 733 \\ + 226 \\ \hline 959 \end{array}$

Addition: 3 digits with no regrouping... 17

OBJECTIVE

To add two 3-digit whole numbers without regrouping

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activity Review the method for addition of 2-digit whole numbers (page 6). Through appropriate demonstration, establish the following ideas.

1. Place value: Numbers are aligned one under another so that we add like units.

2. Direction: In the short-form algorithm we move from right to left. Provide students with a number of chalkboard examples similar to the one in the display.

Using the Book As students work on Exercises 1-15, move about the room. Ensure that students have copied the questions correctly. Students with incorrect sums may require further drill with basic addition facts.

ACTIVITIES

1. Provide questions similar to those below and ask students to find the "missing digits". (Answers are in brackets.)

(a) $\begin{array}{r} 2\blacksquare \\ + \blacksquare 1 \\ \hline 68 \end{array}$ $\left(\begin{array}{r} 27 \\ + 41 \\ \hline 68 \end{array} \right)$ (b) $\begin{array}{r} 21\blacksquare \\ + \blacksquare\blacksquare 5 \\ \hline 349 \end{array}$ $\left(\begin{array}{r} 214 \\ + 135 \\ \hline 349 \end{array} \right)$

(c) $\begin{array}{r} 42\blacksquare \\ + 3\blacksquare 4 \\ \hline \blacksquare 49 \end{array}$ $\left(\begin{array}{r} 425 \\ + 324 \\ \hline 749 \end{array} \right)$

2. Copy this puzzle on the chalkboard (or duplicate) and have the students complete it. (Answers are given.)

Errors can easily be determined by the students if the puzzle does not work out correctly.

a	b	c	
3	5	8	
	d	5	e
	9		4
f		g	
8		7	7
h			
6	3		

ACROSS

a $102 + 256$
d $512 + 442$
g $33 + 44$
h $21 + 42$

DOWN

b $26 + 33$
c $422 + 435$
e $32 + 15$
f $50 + 36$

3. After having tried Activity 2, challenge students to construct their own puzzles. Graph paper and hand calculators may be used to further enhance this activity.

OBJECTIVE

To develop an exchange procedure in preparation for regrouping in addition

PACING

Level A All
Level B All
Level C All

VOCABULARY

trade (exchange)

MATERIALS

base-ten blocks or play money in the following denominations — one-dollar bills, dimes, and pennies

RELATED AIDS

HMS — DM2.

SUGGESTIONS

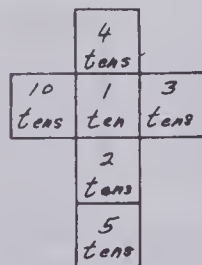
Initial Activity This lesson attempts to further refine place-value skills by emphasizing the “exchange rate” that exists between one unit and another. Base-ten blocks or play money can be used effectively to demonstrate this relationship and provide a concrete basis for regrouping in addition.

Ask questions such as: “How many tens (dimes) for forty ones (pennies)?” “How many hundreds (dollars) for thirty tens (dimes)?”

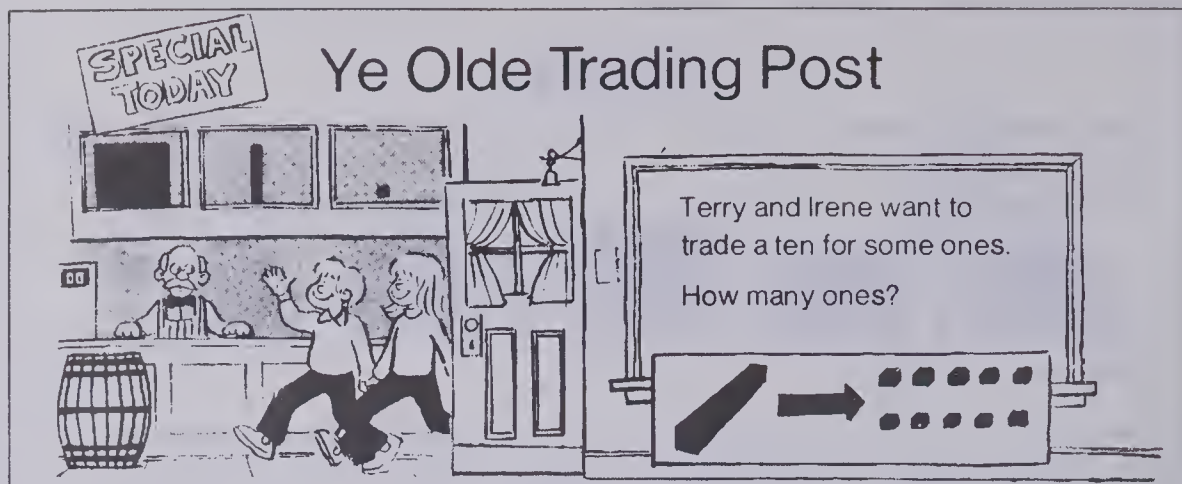
Include questions such as: “How many tens (dimes) for 53 ones (pennies)? How many ones (pennies) left over?”

ACTIVITIES

1. Play the game “300”. Using a commercial blank die or one made from Bristol board, write the following on the faces of the cube.



Each player in turn rolls the die, recording the number of tens shown on the upper face. As play progresses, students should, when appropriate, record an exchange of 10 tens for 100. First person to reach “300” wins!



Exercises

Help Terry and Irene trade these.
How many?

1. for 10

2. for 100

3. for 10

How many tens can Terry get for the following?

	tens	ones left over
1. 26 ones	2	6
6. 70 ones	7	0
8. 89 ones	8	9

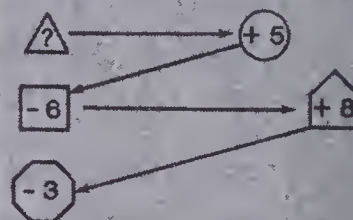
	tens	ones left over
5. 32 ones	3	2
7. 55 ones	5	5
9. 17 ones	1	7

How many hundreds can Irene get for the following?

	hundreds	tens left over
1. 13 tens	1	3
12. 29 tens	2	9
14. 38 tens	3	8

	hundreds	tens left over
11. 20 tens	2	0
13. 67 tens	6	7
15. 92 tens	9	2

BRAINTICKLER



The final answer is 10.
What number did I start with? 6

18 Trading

Using the Book You may want to work with the students on Exercises 1-5 to reinforce the idea of “exchange rate” and to make sure instructions are understood. Exercises 6-15 could be done independently.

Encourage all students to attempt a solution for the Braintickler. It would be profitable to discuss the various problem-solving approaches used by students.

Example

	h	t
1.		4
2.		2
3.		8
4.	1	1
5.	etc	
6.		

2. Play “Concentration”, the rules for which are outlined in the Activity Reservoir. Use cards such as:

36

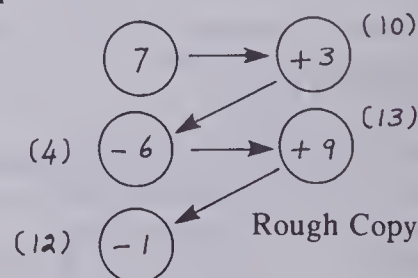
3 tens, 6 ones

47

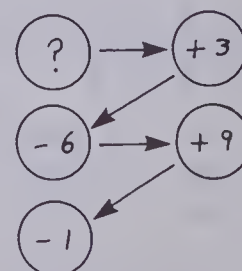
4 tens, 7 ones

3. Encourage some students to create their own puzzles similar to the one in the Braintickler. Suggest that each puzzle be done in “rough” first (including the starting number), then recopied without the starting number. This process encourages students to

make sure their puzzle works before handing it to a classmate to solve.
Example



Good Copy



The final answer is 12.
What number did I start with?

The Red Pop Shop

174 giant bottles were sold in the first week.
168 giant bottles were sold in the second week.
How many giant bottles were sold altogether?

**SPECIAL
FEATURE**
GIANT BOTTLES
of RED POP
1.5 L
ON SALE NOW



Brenda uses a short form.

Add ones.

$$\begin{array}{r} 174 \\ +168 \\ \hline 2 \end{array}$$

Add tens.

$$\begin{array}{r} 174 \\ +168 \\ \hline 42 \end{array}$$

Add hundreds.

$$\begin{array}{r} 174 \\ +168 \\ \hline 342 \end{array}$$

342 giant bottles sold altogether.

Exercises

Add using the short form.

$$\begin{array}{r} 227 \\ +188 \\ \hline 415 \end{array}$$

$$\begin{array}{r} 368 \\ +379 \\ \hline 747 \end{array}$$

$$\begin{array}{r} 265 \\ +186 \\ \hline 451 \end{array}$$

$$\begin{array}{r} 427 \\ +395 \\ \hline 822 \end{array}$$

$$\begin{array}{r} 298 \\ +246 \\ \hline 544 \end{array}$$

$$\begin{array}{r} 6. \quad 535 \\ +288 \\ \hline 823 \end{array}$$

$$\begin{array}{r} 7. \quad 473 \\ +317 \\ \hline 790 \end{array}$$

$$\begin{array}{r} 8. \quad 625 \\ +285 \\ \hline 910 \end{array}$$

$$\begin{array}{r} 9. \quad 727 \\ +135 \\ \hline 862 \end{array}$$

$$\begin{array}{r} 10. \quad 488 \\ +451 \\ \hline 939 \end{array}$$

Pop sold	1st week	2nd week	Total
11. Ginger Ale	237	384	621
12. Soda Fizz	325	296	621
13. Orange Delight	468	275	743
14. Cola	556	369	925

Addition 3 digits with regrouping 19

OBJECTIVE

To add two 3-digit whole numbers with regrouping

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS—DM3.
BFA COMP LAB II—7.
BFA PROB. SOLVING LAB II—17,
20, 24, 25.

SUGGESTIONS

Initial Activity Review the short-form method for addition to 2-digit addends (page 7). Through appropriate questions, establish the following ideas.

1. Place value: Numbers are aligned one under another so that we add like units.
2. Direction: In the short-form algorithm, we move from right to left.
3. Regrouping: We remind ourselves that regrouping has occurred by placing a representative digit in the appropriate column.

Using the Book Use the display to introduce addition of three-digit addends. Note that the three ideas established above apply here as well. Emphasize that the "1's" used to signal regrouping have different values, depending on their placement (1 ten, 1 hundred, 1 thousand).

Encourage students, when you think they are ready, to make the regrouping mentally. Challenge students to find the total number of all bottles of pop sold in Exercises 11-14. Ask students how the manager of the store might check to see if this total is correct (e.g., the sum of the first week and the second week should equal the grand total).

ACTIVITIES

1. Play "Greatest Sum—Least Sum".
Greatest Sum

(a) Use the spinner illustrated for "The P.V. Game" in the Activity Reservoir.

(b) Students draw blanks equivalent to the size and number of addends. For example, two 3-digit addends:

$$\begin{array}{r} --- \\ + --- \\ \hline \end{array}$$

(c) Spin the spinner. Students place the indicated digit in any one of the blanks, remembering that the object

of the game is to make the greatest addends and therefore the greatest sum.

(d) Repeat the procedure for the remaining blanks.

(e) Students then add. Greatest sum wins.

Least Sum

Follow the same procedure. The object of the game this time is to place the digits in such a way as to produce the least sum.

2. Put copies of the "Addition Boxes" on a ditto sheet or chalkboard and ask students to complete them. Be sure that students understand the instructions. This activity is self-checking (i.e., the sums of the outside

row and column should be equal). (Answers are given in brackets.)

- (a) Add across.
- (b) Add down.
- (c) Find the sum of the right column, then the sum of the bottom row. What do you notice? (Both are the same!)

A	+			B	+		
+	47	38	(85)	+	126	237	(363)
	63	29	(92)		205	410	(615)
	(110)	(67)	(177) ?		331	(647)	(978) ?

3. Write the following list of numbers on the chalkboard:

20, 14, 65, 52, 87, 69, 73, 39, 49

Ask students to arrange the numbers in sets of three each, so that the sum of the three numbers is 156.

- (a) $20 + 87 + 49 = 156$
- (b) $73 + 14 + 69 = 156$
- (c) $65 + 39 + 52 = 156$

City Market

John brought 67 cabbages to market.
He sold 24.
How many cabbages are left?

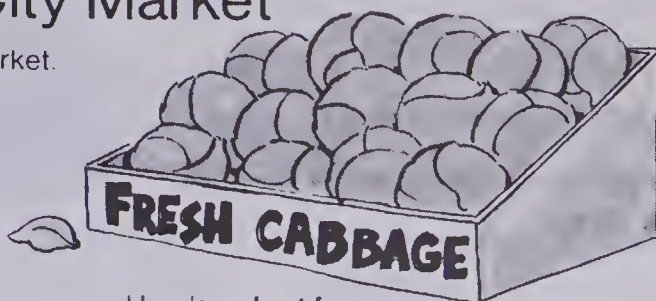
$$\begin{array}{r} 67 \\ - 24 \\ \hline \end{array}$$

Chart form:

tens	ones
6	7
- 2	- 4

4 tens and 3 ones = 43

There are 43 cabbages left.



Here's a short form.

(a) Subtract ones.

$$\begin{array}{r} 67 \\ - 24 \\ \hline 3 \end{array}$$

(b) Subtract tens.

$$\begin{array}{r} 67 \\ - 24 \\ \hline 43 \end{array}$$

Exercises

Subtract using the chart form.

$$\begin{array}{r} 58 \\ - 31 \\ \hline 27 \end{array}$$

$$\begin{array}{r} 65 \\ - 42 \\ \hline 23 \end{array}$$

$$\begin{array}{r} 87 \\ - 46 \\ \hline 41 \end{array}$$

$$\begin{array}{r} 39 \\ - 12 \\ \hline 27 \end{array}$$

$$\begin{array}{r} 83 \\ - 63 \\ \hline 20 \end{array}$$

Subtract using the short form.

$$\begin{array}{r} 64 \\ - 33 \\ \hline 31 \end{array}$$

$$\begin{array}{r} 99 \\ - 26 \\ \hline 73 \end{array}$$

$$\begin{array}{r} 45 \\ - 32 \\ \hline 13 \end{array}$$

$$\begin{array}{r} 58 \\ - 26 \\ \hline 32 \end{array}$$

$$\begin{array}{r} 65 \\ - 20 \\ \hline 45 \end{array}$$

Solve.

11. 27 watermelons.
15 sold.
How many left? 12

12. 48 cucumbers.
32 sold.
How many left? 16

OBJECTIVE

To subtract 2-digit whole numbers without regrouping

PACING

Level A All

Level B All

Level C All

MATERIALS

orange and white rods or base-ten blocks

RELATED AIDS

BFA COMP LAB II — 16.

BFA PROB. SOLVING LAB II — 3, 4, 9, 14.

2. Chart form

3. Short form

tens	ones
4	7
- 2	- 4

$$\begin{array}{r} 47 \\ - 24 \\ \hline 23 \end{array}$$

2 tens and 3 ones = 23

ACTIVITIES

1. Use the game "Toss 'N' Tell" as described in the Activity Reservoir at the front of the book to practise subtraction facts.

2. Introduce students to "Chain Calculations", then have them create their own to exchange with classmates.

Example

(a) "Start with 6, add 5, subtract 2, add 8, add 3."

$$(b) \boxed{4} + \boxed{9} - \boxed{5} + \boxed{7} - \boxed{8}$$

"Chain Calculations" can be used as a written or oral activity.

3. Prepare and distribute a sheet such as:

$$\begin{array}{r} (a) \begin{array}{r} 25 \\ - 12 \\ \hline 13 \end{array} \quad (b) \begin{array}{r} 47 \\ - 27 \\ \hline 20 \end{array} \quad (c) \begin{array}{r} 53 \\ - 30 \\ \hline 23 \end{array} \end{array}$$

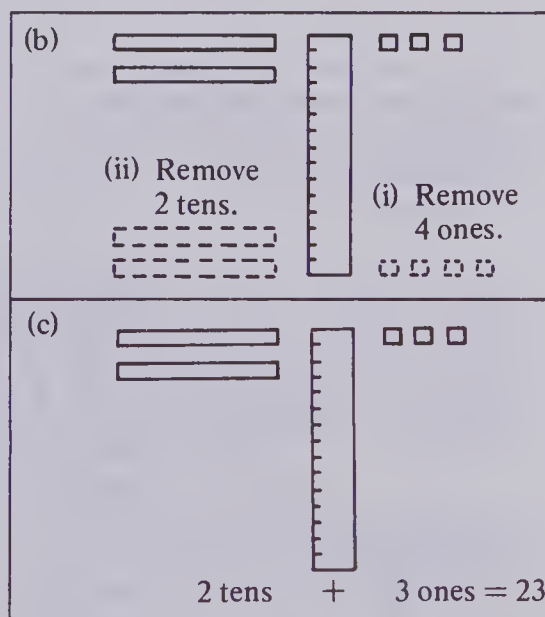
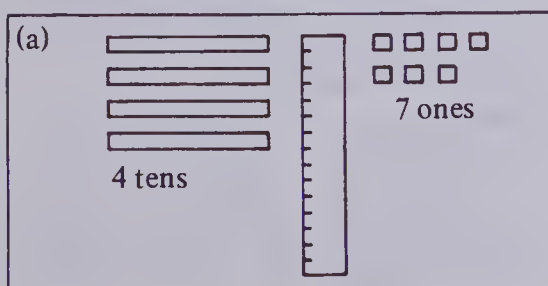
$$\begin{array}{r} (d) \begin{array}{r} 78 \\ - 34 \\ \hline 44 \end{array} \quad (e) \begin{array}{r} 35 \\ - 15 \\ \hline 20 \end{array} \quad (f) \begin{array}{r} \square\square \\ - 27 \\ \hline 51 \end{array} \end{array}$$

$$\begin{array}{r} (g) \begin{array}{r} \square\square \\ - 53 \\ \hline 46 \end{array} \quad (h) \begin{array}{r} \square 6 \\ - 3\square \\ \hline 21 \end{array} \end{array}$$

SUGGESTIONS

Initial Activity To begin this lesson, provide students with orange and white rods or number blocks. Use an overhead projector (or chalkboard) to demonstrate the process of subtraction. Review with students the idea that subtraction is a "take-away" situation. Work through the following stages, having students use the materials at their desks.

$$\begin{array}{r} 47 \\ - 24 \\ \hline \end{array}$$



Concrete examples can lead directly to the written chart and short forms.

Using the Book Use the display to reinforce the methods used for the chart and short forms, then assign the exercises for independent work.

OBJECTIVE

To subtract 2-digit whole numbers with regrouping

PACING

Level A All
Level B All
Level C All

MATERIALS

orange and white rods or base-ten blocks, overhead projector

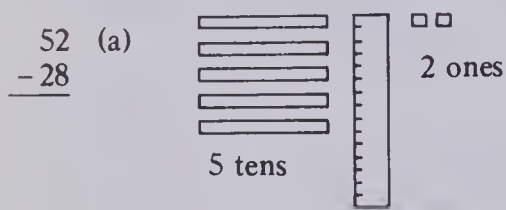
RELATED AIDS

HMS — DM4.
BFA COMP LAB II — 17.
BFA PROB. SOLVING LAB II — 6, 10, 163, 202.

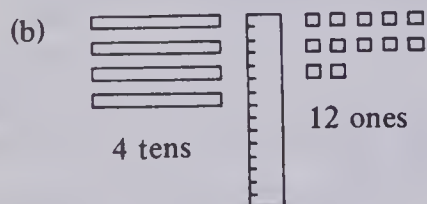
SUGGESTIONS

Initial Activity Provide students with materials such as coloured rods or base-ten blocks. Have them set up a representation of sample questions.

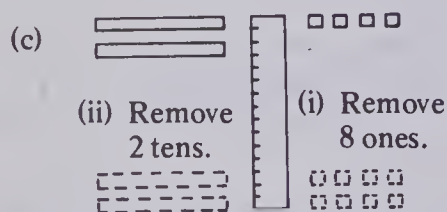
1. Concrete form



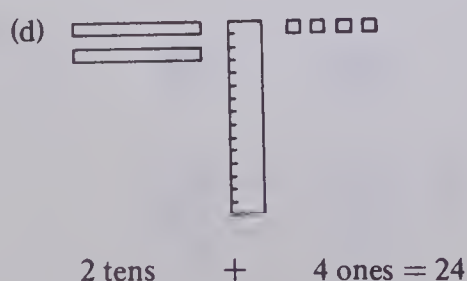
Encourage students to discover how it is possible to remove 8 ones from 2 ones. Some might suggest that an exchange of 1 ten for 10 ones be made.



Students can now proceed with "taking away".



The remaining rods show the difference.



Trucks on the Move

Engineer Joe counted 72 mini-trucks.

He also counted 38 vans.

How many more mini-trucks than vans?



Subtract:

Chart form:

Short form:

Subtract ones.

Subtract tens.

6	12
7	2
-	3 8
	4

6	12
7	2
-	3 8
3	4

6 12

7 2
- 3 8
—
4

6 12

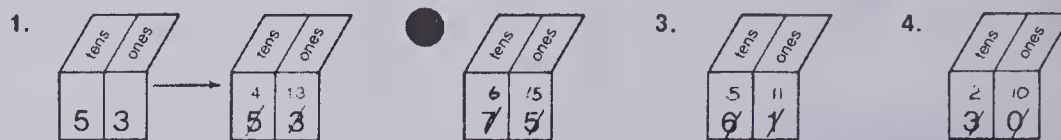
7 2
- 3 8
—
3 4

3 tens and 4 ones = 34

There are 34 more mini-trucks than vans.

Exercises

Rename to show 10 more ones.



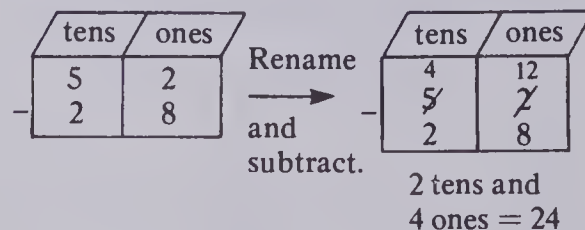
42 - 27 — 15	51 - 38 — 13	35 - 18 — 17	64 - 27 — 37	62 - 34 — 28
82 - 36 — 46	71 - 45 — 26	75 - 16 — 59	40 - 15 — 25	60 - 29 — 31

22 Subtracting 2-digit numbers, regrouping

Using the Book Use the display to reinforce the methods required for the chart and short forms, then assign the exercises for independent work.

The chart and short forms now become more meaningful because students have experienced the process of regrouping (renaming).

2. Chart form



3. Short form

4 12
5 2
- 28
—
24

The act of stroking out and rewriting digits can be tied directly to the exchange of 1 ten for 10 ones using the coloured rods. Encourage students, when they are ready, to regroup mentally.

ACTIVITIES

1. Play the game "Toss 'N' Tell" as described in the Activity Reservoir in the front of the book.

2. Play the game "Concentration" as described in the Activity Reservoir. Make appropriate cards to provide practice with regrouping.

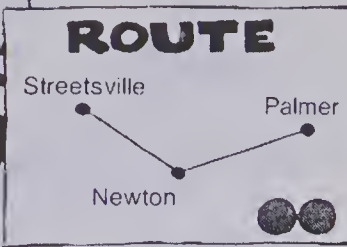
Example

(a) 13 - 7 = 6

(b) 21 - 8 = 13

(Continued on page 23)

Go-Train



258 passengers got on the train at Streetsville.
123 passengers got off the train at Newton.
How many passengers are left on the train?

- (a) Write. (b) Subtract ones. (c) Subtract tens. (d) Subtract hundreds.

$$\begin{array}{r} 258 \\ - 123 \\ \hline \end{array}$$

$$\begin{array}{r} 258 \\ - 123 \\ \hline 5 \end{array}$$

$$\begin{array}{r} 258 \\ - 123 \\ \hline 35 \end{array}$$

$$\begin{array}{r} 258 \\ - 123 \\ \hline 135 \end{array}$$

There are 135 passengers left on the train.

Exercises

Subtract using the short form.

$$\begin{array}{r} 364 \\ - 121 \\ \hline 243 \end{array}$$

$$\begin{array}{r} 558 \\ - 240 \\ \hline 318 \end{array}$$

$$\begin{array}{r} 237 \\ - 212 \\ \hline 25 \end{array}$$

$$\begin{array}{r} 659 \\ - 321 \\ \hline 338 \end{array}$$

$$\begin{array}{r} 473 \\ - 370 \\ \hline 103 \end{array}$$

$$\begin{array}{r} 289 \\ - 104 \\ \hline 185 \end{array}$$

$$\begin{array}{r} 753 \\ - 241 \\ \hline 512 \end{array}$$

$$\begin{array}{r} 518 \\ - 114 \\ \hline 404 \end{array}$$

$$\begin{array}{r} 396 \\ - 324 \\ \hline 72 \end{array}$$

$$\begin{array}{r} 672 \\ - 531 \\ \hline 141 \end{array}$$

11. 345 passengers on at Drayton.
124 passengers off at Rockville.
How many passengers left? 221

12. 268 passengers on at Weber.
227 passengers off at York.
How many passengers left? 41

Subtraction: 3 digits, no regrouping 23

Using the Book Review briefly the subtraction of 2-digit whole numbers (page 21). Use the problem in the display on this page to introduce subtraction with hundreds. Point out that, as with 2-digit subtraction, we work from right to left, subtracting the bottom number from the top number.

OBJECTIVE

To subtract 3-digit whole numbers without regrouping

PACING

Level A All
Level B All
Level C All

ACTIVITIES

1. To reinforce basic subtraction facts, introduce students to the following array:

(a) Place any number under each of A, B, C, D.

Example

$$\begin{array}{r} A \\ 9 \end{array} \quad \begin{array}{r} B \\ 3 \end{array} \quad \begin{array}{r} C \\ 7 \end{array} \quad \begin{array}{r} D \\ 12 \end{array}$$

(b) Use the following sequence, always remembering to subtract the least number from the greatest. This generates a new set of four numbers.

Example

(A, B), (B, C), (C, D), (A, D)

$$\begin{array}{r} A \\ 9 \end{array} \quad \begin{array}{r} B \\ 3 \end{array} \quad \begin{array}{r} C \\ 7 \end{array} \quad \begin{array}{r} D \\ 12 \end{array}$$

$$\begin{array}{r} 6 \end{array} \quad \begin{array}{r} 4 \end{array} \quad \begin{array}{r} 5 \end{array} \quad \begin{array}{r} 3 \end{array}$$

(c) Repeat the sequence. Eventually zeros will appear!

$$\begin{array}{r} A \\ 9 \end{array} \quad \begin{array}{r} B \\ 3 \end{array} \quad \begin{array}{r} C \\ 7 \end{array} \quad \begin{array}{r} D \\ 12 \end{array}$$

$$\begin{array}{r} 6 \end{array} \quad \begin{array}{r} 4 \end{array} \quad \begin{array}{r} 5 \end{array} \quad \begin{array}{r} 3 \end{array}$$

$$\begin{array}{r} 2 \end{array} \quad \begin{array}{r} 1 \end{array} \quad \begin{array}{r} 2 \end{array} \quad \begin{array}{r} 3 \end{array}$$

$$\begin{array}{r} 1 \end{array} \quad \begin{array}{r} 1 \end{array} \quad \begin{array}{r} 1 \end{array} \quad \begin{array}{r} 1 \end{array}$$

$$\begin{array}{r} 0 \end{array} \quad \begin{array}{r} 0 \end{array} \quad \begin{array}{r} 0 \end{array} \quad \begin{array}{r} 0 \end{array}$$

This activity is self-checking. If zeros do not appear, an error has been made. Encourage students to try odd numbers, even numbers, greater numbers, etc.

(Continued from page 22)

3. Copy these "Subtraction Boxes" on the chalkboard, asking students to complete them. Ask students what they notice about the final difference. (Answers are given in brackets.)
Example

- (a) Subtract down.
(b) Subtract across.
(c) Subtract the numbers in the right column, then subtract the numbers in the bottom row.

What do you notice?

This activity is self-checking. If the final differences are not the same (e.g., 4 in box A), then an error has been made.

Encourage students to construct their own "Subtraction Boxes" and exchange with a classmate.

A		
→		
37	28	(9)
19	14	(5)
(18)	(14)	(4)

B		
→		
51	26	(25)
25	18	(7)
(26)	(8)	(18)

OBJECTIVE

To subtract 3-digit whole numbers with regrouping

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS — DM5.
BFA COMP LAB II — 20.
BFA PROB. SOLVING LAB II — 18,
19, 22, 26, 165-167, 205, 207.

SUGGESTIONS

Initial Activity Review the short-form method for subtraction of 2-digit whole numbers (page 22). As part of the review, you may wish to include a brief regrouping exercise.

Example

"Rename to show 10 more ones."

tens	ones
3	17
3	7

Extend the exercise to include the following:

"Rename to show 10 more ones, then rename to show 10 more tens."

Step 1

hundreds	tens	ones
6	3	17
	3	7

Step 2

hundreds	tens	ones
5	13	17
6	3	7

ACTIVITIES

1. For a related activity, or one that could easily be modified, see Sum-It in the Activity Reservoir.

2. Prepare 9 cards, each of which has one of these numbers: 307, 804, 158, 506, 118, 577, 189, 227, 348. Challenge the students to arrange them in correct order to show 3 subtraction exercises.

Country Villages

Dunham — population 634
Oakum — population 286



(a) Write.
634
- 286

How many more people live in Dunham than in Oakum?

(b) Rename and subtract ones.

$$\begin{array}{r} 634 \\ - 286 \\ \hline 8 \end{array}$$

(c) Rename and subtract tens.

$$\begin{array}{r} 534 \\ - 286 \\ \hline 48 \end{array}$$

(d) Subtract hundreds.

$$\begin{array}{r} 12 \\ 714 \\ - 286 \\ \hline 348 \end{array}$$

There are 348 more people in Dunham than in Oakum.

Exercises

1. Rename to show 10 more ones.

(a)

tens	ones
5	3
	3

(b)

tens	ones
5	12
5	2

(c)

tens	ones
1	15
1	5

2. Rename to show 10 more tens.

(a)

hundreds	tens	ones
5	15	2
5	5	2

(b)

hundreds	tens	ones
8	14	6
8	4	6

(c)

hundreds	tens	ones
7	13	5
7	3	5

3. (a) $\begin{array}{r} 725 \\ - 358 \\ \hline 367 \end{array}$ (b) $\begin{array}{r} 824 \\ - 436 \\ \hline 388 \end{array}$ (c) $\begin{array}{r} 521 \\ - 84 \\ \hline 437 \end{array}$ (d) $\begin{array}{r} 435 \\ - 149 \\ \hline 286 \end{array}$ (e) $\begin{array}{r} 982 \\ - 690 \\ \hline 292 \end{array}$

24 Subtracting 3-digit numbers: regrouping

Using the Book Use the example in the display or a similar one to demonstrate the procedure used for the short form. Complete Exercises 1 and 2 orally. Assign Exercise 3 and circulate about the room while it is being completed. You may wish to remind the children that the answers for Exercises 3(a) and 3(b) are in the back of the book.

Answer: $\begin{array}{r} 307 \\ - 118 \\ \hline 189 \end{array}$ $\begin{array}{r} 804 \\ - 227 \\ \hline 577 \end{array}$ $\begin{array}{r} 506 \\ - 348 \\ \hline 158 \end{array}$

3. Use a calculator to prepare 9 subtraction exercises with answers of the type on this page. When the 9 differences are known, display them only on the chalkboard. Distribute blank 3×3 grids to students and have them randomly place a number in each place on the grid.

Example

Display large cards such as:

178	206	227
441	36	334
189	537	811

Players copy and complete calculation and cross off appropriate

number on their playing card. Usual Bingo rules apply.

EXTRA PRACTICE

This would be an appropriate place in your regular drill program to provide practice with appropriate subtraction facts.

Example

$\begin{array}{r} 14 \\ - 8 \end{array}$ $\begin{array}{r} 16 \\ - 7 \end{array}$ $\begin{array}{r} 12 \\ - 9 \end{array}$ and so on.

Students would benefit from both oral and written drill. You may wish to provide practice with subtraction questions that involve only partial regrouping, i.e., regrouping from hundreds to tens only; regrouping from tens to ones only; examples where regrouping results in a zero in the difference.

Flight Attendant



1. The airplane on Maxine's flight has 265 seats.
Maxine counts 178 passengers.
How many empty seats are there? 87
2. Sandy checks the number of soft drinks in the storage galley.
She counts 93 Cola and 57 Ginger ale.
How many more Cola are there than Ginger ale? 36
3. There are 276 passengers on a Trans-Atlantic flight to London.
Sandy provided 152 passengers with pillows.
How many passengers did not have pillows? 124
4. On a morning flight to Vancouver, 37 passengers wanted to read newspapers and 56 wanted to read magazines.
How many more magazines were read than newspapers? 19
5. Over the last few months, Carlos has flown 324 h while Maxine has flown 286 h.
How many more hours has Carlos flown than Maxine? 38 h
6. Last Saturday, Carlos' flight covered 545 km while Sandy's flight covered 823 km.
How many more kilometres did Sandy fly than Carlos? 278 km

Problem solving 25

Using the Book You may want to work together with the students on Exercise 1 to reinforce your problem-solving format, then allow students to work independently.

(Continued from Chapter Overview)

CAREER AWARENESS

travellers at ease, particularly those who may be flying for the first time. They pay special attention to children who may be travelling alone and to passengers who are handicapped.

Flight attendants must be knowledgeable about safety procedures if an emergency occurs. They demonstrate how the oxygen masks work and point out the emergency exit doors. Their professional training helps them to be a calm and steadying influence in times of stress (such as poor weather conditions).

Flight attendants are generally responsible for the comfort of the passengers. They serve beverages, and, on many flights, must serve meals. Tired travellers may ask for pillows to help them sleep. Others will be provided with newspapers and magazines. Their congenial attention to passenger needs helps to make a relaxed atmosphere.

Flight attendants may return to the original air terminal the same day on another flight. On long international flights they must stay over and return a few days later. This may allow them to see exciting places in the world — London, Paris, a South Sea Island!

OBJECTIVE

To solve word problems involving subtraction

PACING

Level A All

Level B All

Level C All

RELATED AIDS

HMS — DM6.

BFA PROB. SOLVING LAB II — 7, 8, 23, 28.

SUGGESTIONS

Initial Activity Refer to the "Career Awareness" in the Chapter Overview. You may wish to use the description of the flight attendant as a basis for discussion with the class. Some students may have had experiences with air travel which they could share with the class.

Review the four questions of Professor Q (page 8) and be sure children understand the problem-solving format you have established as a result of work on pages 10 and 11.

ACTIVITIES

1. Airline brochures (available from travel agencies) usually contain interesting data which could be used to develop word problems.

2. See Activities for page 9.

3. Provide students with two or three open number sentences. Ask them to create a word problem based on the number sentence. Use the airline theme, or another one of interest to your students.

Example

$$45 + 62 = \blacksquare$$

Maxine stored 45 ham sandwiches and 62 beef sandwiches in the galley. How many sandwiches were there altogether?

$$32 - 17 = \blacksquare$$

32 people read the sports magazines and 17 read the news magazines. How many more people read the sports magazines?

OBJECTIVE

To check subtraction answers by using addition

PACING

Level A All
Level B All
Level C All

RELATED AIDS

BFA PROB. SOLVING LAB II — 11, 12.

SUGGESTIONS

Initial Activity This lesson could be introduced through the use of patterns.

Write a number of simple subtraction questions on the chalkboard or provide students with a worksheet.

$$\begin{array}{r} 6 \\ -2 \\ \hline \end{array} \quad \begin{array}{r} 8 \\ -3 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ -7 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ -12 \\ \hline \end{array} \quad \dots$$

After students have subtracted, draw their attention to the subtrahend and difference of the first two or three questions.

$$\begin{array}{r} 6 \\ -2 \\ \hline 4 \end{array} \quad \begin{array}{r} 8 \\ -3 \\ \hline 5 \end{array} \quad \begin{array}{r} 12 \\ -7 \\ \hline 5 \end{array}$$

Encourage students to discover the relationship between the circled numbers and the minuend. (The sum of the circled numbers equals the minuend.) Some students might suggest that they have found examples where the relationship "doesn't work". Use this opportunity to demonstrate that an error has occurred in the subtraction process. Encourage students to discover that this procedure could be used to check subtraction.

ACTIVITIES

1. Children might enjoy learning about other ways to check their work. The unitate method (similar to "casting out nines") works with both addition and subtraction. It's a simple process of summing the digits until a 1-digit number is produced.

Example

The unitate of 438 is 6:
 $4 + 3 + 8 = 15 \longrightarrow 1 + 5 = 6$

The unitate of 124 is 7:

$$1 + 2 + 4 = 7$$

Let's Make Sure



$$\begin{array}{r} ? \quad 86 \quad ? \\ - \quad 54 \quad ? \\ \hline 32 \end{array}$$

$$\begin{array}{r} (a) \quad 86 \\ - 54 \\ \hline 32 \end{array} \quad \text{Subtract.}$$

$$\begin{array}{r} (b) \quad 86 \\ - 54 \\ \hline + 32 \\ \hline 86 \end{array} \quad \text{Add.}$$

$$\begin{array}{r} (c) \quad 86 \\ - 54 \\ \hline + 32 \\ \hline 86 \end{array} \quad \text{Compare.}$$

Same numbers \longrightarrow correct answer.

Different numbers \longrightarrow incorrect answer; subtract again.

Exercises

Check by addition to find the ones with correct answers.

$$\begin{array}{r} \bullet \quad 48 \\ - 21 \\ \hline 26 \end{array}$$

Incorrect.
Subtract, then check by addition.

$$\begin{array}{r} \bullet \quad 275 \\ - 123 \\ \hline 152 \end{array}$$

Correct

$$\begin{array}{r} 3. \quad 67 \\ - 13 \\ \hline 54 \end{array}$$

Correct

$$\begin{array}{r} 4. \quad 378 \\ - 165 \\ \hline 223 \end{array}$$

Incorrect

$$\begin{array}{r} 5. \quad 989 \\ - 658 \\ \hline 341 \end{array}$$

Incorrect

$$\begin{array}{r} \bullet \quad 882 \\ - 140 \\ \hline 742 \end{array}$$

$$\begin{array}{r} 11. \quad 568 \\ - 225 \\ \hline 343 \end{array}$$

$$\begin{array}{r} 16. \quad 374 \\ - 156 \\ \hline 218 \end{array}$$

$$\begin{array}{r} \bullet \quad 95 \\ - 42 \\ \hline 53 \end{array}$$

$$\begin{array}{r} 12. \quad 782 \\ - 391 \\ \hline 391 \end{array}$$

$$\begin{array}{r} 17. \quad 75 \\ - 39 \\ \hline 36 \end{array}$$

$$\begin{array}{r} \bullet \quad 649 \\ - 205 \\ \hline 444 \end{array}$$

$$\begin{array}{r} 13. \quad 87 \\ - 25 \\ \hline 62 \end{array}$$

$$\begin{array}{r} 18. \quad 623 \\ - 256 \\ \hline 367 \end{array}$$

$$\begin{array}{r} 9. \quad 65 \\ - 32 \\ \hline 33 \end{array}$$

$$\begin{array}{r} 14. \quad 465 \\ - 127 \\ \hline 338 \end{array}$$

$$\begin{array}{r} 19. \quad 583 \\ - 345 \\ \hline 238 \end{array}$$

$$\begin{array}{r} 10. \quad 435 \\ - 22 \\ \hline 413 \end{array}$$

$$\begin{array}{r} 15. \quad 648 \\ - 39 \\ \hline 609 \end{array}$$

$$\begin{array}{r} 20. \quad 983 \\ - 874 \\ \hline 109 \end{array}$$

26 Checking subtraction by addition

Using the Book Work cooperatively on Exercises 1-5. You might do this orally, asking students to indicate where errors have been made. Ask volunteers to come to the chalkboard to show the correct answers. (Exercises 1, 4, and 5 are incorrect.) Assign Exercises 6-20 for independent work.

Checking Subtraction

$$\begin{array}{r} 782 \rightarrow 17 \rightarrow 8 \\ - 491 \rightarrow 14 \rightarrow 5 \\ \hline 291 \end{array}$$

12 \rightarrow 3

Check.

1. Sum the digits of the minuend and subtrahend. (8, 5)
2. Subtract. ($8 - 5 = 3$)
3. Sum the digits of the original difference. (3)
4. If digits are the same, the answer is correct.

Note: If the digit of the minuend is smaller than the digit of the subtrahend, add 9.

Example

$$\begin{array}{r} 4 \\ - 7 \\ \hline ? \end{array} \quad \begin{array}{r} 4 \\ - 7 \\ \hline \end{array} \quad + 9 \quad \begin{array}{r} 13 \\ - 7 \\ \hline 6 \end{array}$$

Checking Addition

$$\begin{array}{r} 463 \rightarrow 13 \rightarrow 4 \\ + 298 \rightarrow 19 \rightarrow 10 \rightarrow 1 \\ \hline 761 \end{array}$$

14 \rightarrow 5

Check.

1. Sum digits of addends. (4, 1)
2. Add. ($4 + 1 = 5$)
3. Sum digits of original sum. (5)
4. If digits are the same, the answer is correct.

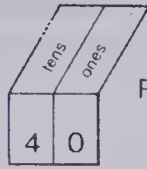
As children become more proficient, much of the "summing" process can be done mentally.

Working With Zero

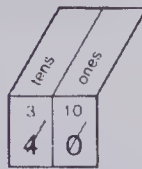
Peter and Karen are working with zeros.

Peter thinks:

$$\begin{array}{r} ? \ 40 \\ ? \ -13 \\ \hline ? \end{array}$$



Rename

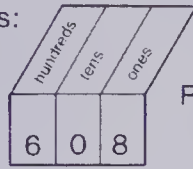


Peter writes:

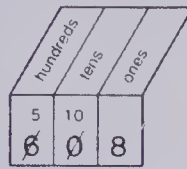
$$\begin{array}{r} 3 \ 10 \\ \cancel{4}0 \\ -13 \\ \hline 27 \end{array}$$

Karen thinks:

$$\begin{array}{r} ? \ 608 \\ ? \ -235 \\ \hline ? \end{array}$$



Rename



Karen writes:

$$\begin{array}{r} 5 \ 10 \\ \cancel{6}08 \\ -235 \\ \hline 373 \end{array}$$

Exercises

Rename, then subtract.

1. $\begin{array}{r} 4 \ 10 \\ \cancel{5}0 \\ -15 \\ \hline 35 \end{array}$	2. $\begin{array}{r} 7 \ 10 \\ \cancel{8}0 \\ -46 \\ \hline 34 \end{array}$	3. $\begin{array}{r} 2 \ 10 \\ \cancel{3}0 \\ -18 \\ \hline 12 \end{array}$	4. $\begin{array}{r} 7 \ 10 \\ \cancel{8}0 \\ -25 \\ \hline 55 \end{array}$	5. $\begin{array}{r} 6 \ 10 \\ \cancel{7}0 \\ -18 \\ \hline 52 \end{array}$
6. $\begin{array}{r} 6 \ 10 \\ \cancel{7}05 \\ -241 \\ \hline 464 \end{array}$	7. $\begin{array}{r} 5 \ 10 \\ \cancel{6}08 \\ -452 \\ \hline 156 \end{array}$	8. $\begin{array}{r} 3 \ 10 \\ \cancel{4}09 \\ -233 \\ \hline 176 \end{array}$	9. $\begin{array}{r} 4 \ 10 \\ \cancel{5}07 \\ -354 \\ \hline 153 \end{array}$	10. $\begin{array}{r} 3 \ 10 \\ \cancel{4}03 \\ -271 \\ \hline 132 \end{array}$
11. $\begin{array}{r} 5 \ 10 \\ \cancel{6}0 \\ -225 \\ \hline 335 \end{array}$	12. $\begin{array}{r} 2 \ 10 \\ \cancel{3}08 \\ -174 \\ \hline 134 \end{array}$	13. $\begin{array}{r} 7 \ 10 \\ \cancel{8}0 \\ -437 \\ \hline 343 \end{array}$	14. $\begin{array}{r} 5 \ 10 \\ \cancel{6}02 \\ -456 \\ \hline 146 \end{array}$	15. $\begin{array}{r} 6 \ 10 \\ \cancel{7}08 \\ -27 \\ \hline 678 \end{array}$

Zero in subtraction: 1's column, 10's column, regrouping 27

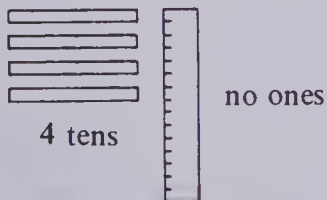
Using the Book Note that Exercises 1-5 provide practice with regrouping from the ten's to one's column and Exercises 6-10 use regrouping from the hundred's to ten's column. Exercises 11-15 provide a mixture of both types.

SUGGESTIONS

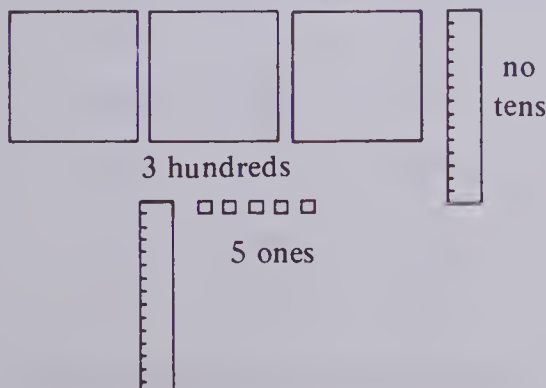
Initial Activity Review with students the fact that zero is a placeholder, and depending on its place indicates no ones, no tens, If pupils are unsure of this concept, provide a concrete or visual demonstration.

Example

1. 40

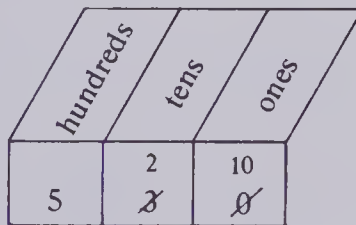


2. 305

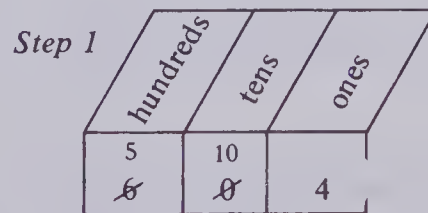


Allow pupils time to work with regrouping exercises similar to these.

1. "Rename to show 10 more ones."



2. "Rename to show 10 more tens, then rename to show 10 more ones."



OBJECTIVE

To subtract 3-digit whole numbers when a zero is included in the one's or ten's column of the minuend

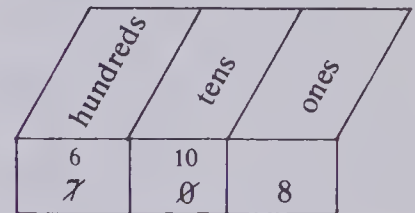
PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS — DM4, 5, 6, 7.
BFA COMP LAB II — 18, 19.

3. "Rename to show 10 more tens."



As you begin to work sample subtraction questions on the chalkboard, include examples where regrouping is unnecessary in one or more columns.

(a) $\begin{array}{r} 558 \\ -123 \\ \hline 435 \end{array}$	(b) $\begin{array}{r} 604 \\ -252 \\ \hline 352 \end{array}$
--	--

ACTIVITIES

1. To reinforce basic skills in addition and subtraction, play the game "Bingo" as described in the Activity Reservoir at the front of the book.

2. Provide a chart similar to this one on the chalkboard and have students complete it.

Number	Subtract 4	Add 9
5	—	—
8	—	—
13	—	—
7	—	—
20	—	—
etc.		

3. Ask children to meet this challenge. "The difference of two of these numbers is exactly 158. Find the two numbers."

$$609, 461, \underline{428}, 459, 621, \underline{586}$$

$$(586 - 428 = 158)$$

OBJECTIVE

To subtract 3-digit whole numbers using the short form when a zero is included in the ten's column of the minuend

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activity Review the concept of zero as a placeholder and what happens to a zero in the regrouping process. (See Initial Activity, page 27.)

ACTIVITIES

1. You might want to have children play the game "Greatest Difference—Least Difference". The goal of this game is to find the greatest (or least) possible difference between two numbers. The rules and equipment are the same as those used in "Greatest Sum—Least Sum" (see page 19) except that the operation is subtraction.

2. Reinforce basic addition and subtraction facts by using a grid similar to this one. Students might enjoy creating their own. (Answers are in brackets.)

▲	8	7	12	5	20	9
●	4	6	9	2	11	7
▲ + ●	(12)	(13)	(21)	(7)	(31)	(16)
▲ - ●	(4)	(1)	(3)	(3)	(9)	(2)

3. Place questions like these on the chalkboard and ask students to find the missing digits. (Answers are in brackets.)

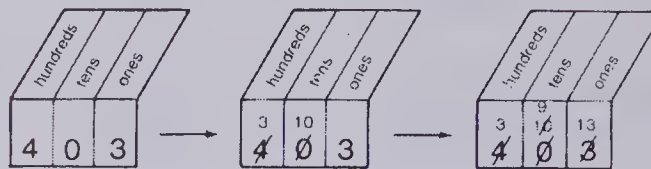
(a)
$$\begin{array}{r} 60\blacksquare \\ - \blacksquare 35 \\ \hline 372 \end{array}$$
 (b)
$$\begin{array}{r} 5\blacksquare 3 \\ - 346 \\ \hline \blacksquare 57 \end{array}$$
 (c)
$$\begin{array}{r} 7\blacksquare 1 \\ - 425 \\ \hline \blacksquare 7\blacksquare \end{array}$$
 (d)
$$\begin{array}{r} 50\blacksquare \\ - \blacksquare\blacksquare 3 \\ \hline 3\blacksquare 6 \end{array}$$

More Zeros

$$\begin{array}{r} ? 403 ? \\ ? - 125 ? \\ \hline ? \end{array}$$

Mark works with this special problem.

Mark thinks:

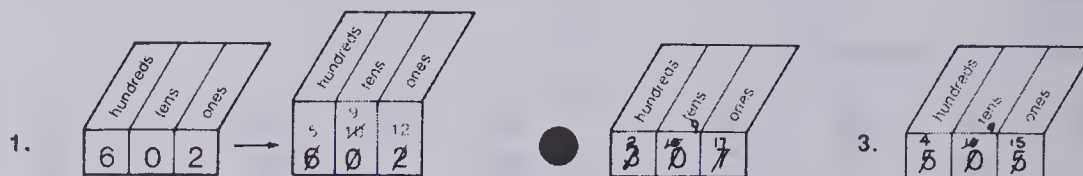


Mark writes:

$$\begin{array}{r} 9 \\ 3 \cancel{0} 13 \\ - 125 \\ \hline 278 \end{array}$$

Exercises

Rename to show more tens and ones.



Rename, then subtract.

1.
$$\begin{array}{r} 9 \\ 5 \cancel{0} 14 \\ - 328 \\ \hline 276 \end{array}$$
 2.
$$\begin{array}{r} 9 \\ 6 \cancel{0} 15 \\ - 536 \\ \hline 169 \end{array}$$
 3.
$$\begin{array}{r} 9 \\ 3 \cancel{0} 12 \\ - 118 \\ \hline 284 \end{array}$$
 4.
$$\begin{array}{r} 9 \\ 2 \cancel{0} 17 \\ - 159 \\ \hline 148 \end{array}$$
 5.
$$\begin{array}{r} 9 \\ 7 \cancel{0} 13 \\ - 517 \\ \hline 286 \end{array}$$

6.
$$\begin{array}{r} 9 \\ 4 \cancel{0} 12 \\ - 163 \\ \hline 339 \end{array}$$
 7.
$$\begin{array}{r} 9 \\ 8 \cancel{0} 10 \\ - 235 \\ \hline 672 \end{array}$$
 8.
$$\begin{array}{r} 9 \\ 7 \cancel{0} 15 \\ - 478 \\ \hline 327 \end{array}$$

9.
$$\begin{array}{r} 9 \\ 6 \cancel{0} 11 \\ - 456 \\ \hline 245 \end{array}$$
 10.
$$\begin{array}{r} 9 \\ 5 \cancel{0} 16 \\ - 249 \\ \hline 357 \end{array}$$
 11.
$$\begin{array}{r} 9 \\ 4 \cancel{0} 12 \\ - 163 \\ \hline 339 \end{array}$$
 12.
$$\begin{array}{r} 9 \\ 8 \cancel{0} 10 \\ - 235 \\ \hline 672 \end{array}$$
 13.
$$\begin{array}{r} 9 \\ 7 \cancel{0} 15 \\ - 478 \\ \hline 327 \end{array}$$

28 Zero in subtraction: 10's column, regrouping

Using the Book The subtraction questions on this page require regrouping from hundreds to tens and tens to ones.

Use the example in the display to demonstrate the regrouping procedure. Reemphasize that what we are doing in the display and in Exercises 1, 2, and 3 is called "renaming" and is often necessary before we can subtract in the usual way. Point out that in Exercises 4-13, we must rename first, then subtract.

Double Zeros



$$\begin{array}{r} ? \\ 500 \quad ? \\ ? - 352 \quad ? \\ \hline ? \end{array}$$

Notice how Kristen works with double zeros.

Kristen writes:

Kristen thinks:

h	t	o
5	0	0

 \rightarrow

h	t	o
4	10	
5	0	0

 \rightarrow

h	t	o
4	9	10
5	0	0

$$\begin{array}{r} 9 \\ 4 \cancel{10} 10 \\ \underline{500} \\ - 352 \\ \hline 148 \end{array}$$

Exercises

Rename to show more tens and ones.

1.

h	t	o
3	0	0

 \rightarrow

h	t	o
2	10	10
3	0	0

h	t	o
7	0	0

3.

h	t	o
2	0	0

Rename, then subtract.

600 - 257 <hr/> 343	700 - 324 <hr/> 376	6. 200 - 76 <hr/> 124	7. 900 - 255 <hr/> 645	8. 500 - 213 <hr/> 287
9. 300 - 64 <hr/> 236	10. 800 - 186 <hr/> 614	11. 400 - 248 <hr/> 152	12. 700 - 318 <hr/> 382	13. 600 - 442 <hr/> 158
14. 200 - 42 <hr/> 158	15. 500 - 236 <hr/> 264	16. 300 - 167 <hr/> 133	17. 400 - 55 <hr/> 345	18. 800 - 617 <hr/> 183
19. 700 - 281 <hr/> 419	20. 402 - 105 <hr/> 297	21. 706 - 214 <hr/> 492	22. 630 - 304 <hr/> 326	23. 508 - 70 <hr/> 438

Zeros in subtraction: zeros in 1's and 10's columns, regrouping 29

OBJECTIVE

To subtract 3-digit whole numbers using the short form when zeros are included in both the one's and ten's columns of the minuend

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS — DM5, 6, 7.

SUGGESTIONS

Initial Activity Review using the same procedure as employed over the last two pages to emphasize (a) zero as a place-holder; (b) what happens to the number in the higher column of a place-value chart when regrouping is necessary (it becomes lesser by 1); and (c) what happens to a zero during regrouping (it becomes a 10)? Some children may benefit from again seeing a visual demonstration as illustrated in the Initial Activity for page 27. Once the steps in renaming have been firmly established, use them to demonstrate what happens during a calculation such as:

$$\begin{array}{r} 300 \\ - 124 \\ \hline \end{array}$$

Using the Book Use the example in the display to demonstrate that we use the same procedure that worked for us during the last 2 pages. Make sure that the children understand that "h", "t", and "o" in the headings for the place-value charts on this page refer to "hundreds", "tens", and "ones" respectively. Note that Exercises 20-23 include subtraction types from previous pages.

ACTIVITIES

1. Prepare a sheet or exercise such as:

500	122	446
300	488	371
600	333	178
800	254	112
700	129	467

and have them join the minuend, sub-

trahend, and difference.

2. Play "Roller Coaster". Prepare a set of instruction cards (at least 20) such as:

Subtract 128.	Add 200.	Subtract 0.	Add 0.
Shuffle and exchange base numbers.	Subtract 3 tens.	Add 8 ones.	

Players start with a "base number" of 500. Each player selects a card from the deck and follows the instruction (under supervision of other players) to compute a new base number. Player with the highest base number after each has selected 5 cards is the winner.

3. See "Sum-It" in the Activity Reservoir.

OBJECTIVE

To review and practise addition and subtraction skills learned to date

PACING

- Level A Optional
- Level B Optional
- Level C Optional

RELATED AIDS

HMS — DM3.

Practice

Add.

1. 64
+ 31
— 95

2. 56
+ 23
— 79

3. 47
+ 35
— 82

4. 38
+ 29
— 67

5. 89
+ 32
— 121

6. 346
+ 212
— 558

7. 418
+ 431
— 849

8. 289
+ 564
— 853

9. 627
+ 295
— 922

10. 753
+ 69
— 822

Subtract.

11. 74
- 22
— 52

12. 65
- 43
— 22

13. 63
- 48
— 15

14. 82
- 57
— 25

15. 92
- 84
— 8

16. 835
- 212
— 623

17. 684
- 352
— 332

18. 723
- 387
— 336

19. 912
- 468
— 444

20. 935
- 861
— 74

21. 560
- 213
— 347

22. 470
- 346
— 124

23. 850
- 218
— 632

24. 740
- 527
— 213

25. 250
- 37
— 213

26. 708
- 425
— 283

27. 607
- 142
— 465

28. 504
- 412
— 92

29. 909
- 376
— 533

30. 306
- 215
— 91

31. 803
- 326
— 477

32. 602
- 455
— 147

33. 901
- 473
— 428

34. 705
- 297
— 408

35. 605
- 306
— 299

36. 400
- 157
— 243

37. 800
- 576
— 224

38. 700
- 295
— 405

39. 300
- 116
— 184

40. 200
- 108
— 92

30 Practice: addition and subtraction

Using the Book If you wish to have all children complete the whole page, provide time on different days for its completion.

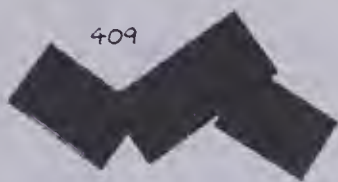
You may wish to provide specific practice for particular students. The exercise numbers, the topics, and the related page numbers in the text are listed in the chart below.

Exercise	Topic	Page
1-2	2-digit addends, without regrouping	6
3-5	2-digit addends, with regrouping	7
6-7	3-digit addends, without regrouping	17
8-10	3-digit addends, with regrouping	19
11-12	Subtraction — 2-digits, without regrouping	21
13-15	Subtraction — 2-digits, with regrouping	22
16-17	Subtraction — 3-digits, without regrouping	23
18-20	Subtraction — 3-digits, with regrouping	24
21-25 and 26-30	Subtraction — 3-digits, with zero	27
31-35	Subtraction — 3-digits, with zero	28
36-40	Subtraction — 3-digits, with two zeros	29

Chapter Test

Write the correct number for each set of mixed-up cards.

1. 409



2. 370



3. 165



Add.

$$\begin{array}{r} 4. \quad 7 + 6 + 4 \\ 17 \end{array}$$

$$\begin{array}{r} 5. \quad 8 \\ 2 \\ + 7 \\ \hline 17 \end{array}$$

$$\begin{array}{r} 6. \quad 35 \\ + 43 \\ \hline 78 \end{array}$$

$$\begin{array}{r} 7. \quad 47 \\ + 19 \\ \hline 66 \end{array}$$

$$\begin{array}{r} 8. \quad 362 \\ + 107 \\ \hline 469 \end{array}$$

$$\begin{array}{r} 9. \quad 215 \\ + 43 \\ \hline 258 \end{array}$$

$$\begin{array}{r} 10. \quad 677 \\ + 294 \\ \hline 971 \end{array}$$

$$\begin{array}{r} 11. \quad 508 \\ + 257 \\ \hline 765 \end{array}$$

Subtract.

$$\begin{array}{r} 12. \quad 76 \\ - 24 \\ \hline 52 \end{array}$$

$$\begin{array}{r} 13. \quad 92 \\ - 58 \\ \hline 34 \end{array}$$

$$\begin{array}{r} 14. \quad 646 \\ - 305 \\ \hline 341 \end{array}$$

$$\begin{array}{r} 15. \quad 722 \\ - 445 \\ \hline 277 \end{array}$$

$$\begin{array}{r} 16. \quad 570 \\ - 316 \\ \hline 254 \end{array}$$

$$\begin{array}{r} 17. \quad 908 \\ - 422 \\ \hline 486 \end{array}$$

$$\begin{array}{r} 18. \quad 403 \\ - 168 \\ \hline 235 \end{array}$$

$$\begin{array}{r} 19. \quad 800 \\ - 325 \\ \hline 475 \end{array}$$

Solve.

20. The radio in a Stratosphere 747 must be checked every 600 h of flying time. The Stratosphere has flown 427 h. How many hours before the radio needs a check-up? 173 h

21. North American Airways sold 573 tickets last week and 368 tickets this week. How many tickets have they sold altogether? 941

OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS — DM8.

Chapter 1 test 31

Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview.

An alternate Chapter Test can be found in Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1-3	A	1-3, 16
4-11	B	6-7, 13-19
12-19	C	21-24, 27-29
20-21	D	8, 10-11

CHAPTER 2 OVERVIEW

This chapter extends place value, addition, and subtraction to the hundred thousand's place. Pairs of numbers up to the thousand's place are compared. Linear measure is introduced with the commonly used metric units of length. Further practice with problem solving is also provided.

OBJECTIVES

- A To write numerals up to the thousands from various forms
- B To compare whole numbers up to the thousand's place
- C To add whole numbers up to six digits with regrouping
- D To subtract whole numbers up to six digits with regrouping
- E To measure with, and develop relationships among, metric linear units of measure
- F To solve word problems

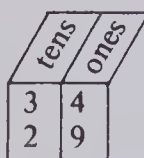
BACKGROUND

There are generally two criteria for effective use of algorithms: that they be efficient and that they be based on some developmental understanding. The computational procedures developed in this chapter rely on previously developed concepts such as basic facts, number properties, place value, and operating procedures for algorithms.

Note the following examples.

(a)
$$\begin{array}{r} 34 \\ + 29 \\ \hline \end{array}$$

$$\begin{aligned} &(30 + 4) + (20 + 9) && \text{renaming} \\ &= (30 + 20) + (4 + 9) && \text{grouping + order properties} \\ &= 50 + 13 && \text{addition} \\ &= 50 + (10 + 3) && \text{renaming} \\ &= (50 + 10) + 3 && \text{grouping property} \\ &= 60 + 3 && \text{addition} \\ &= 63 && \text{numeral} \end{aligned}$$

(b) 

$$\begin{aligned} &5 \text{ tens and } 13 \text{ ones} \\ &= 6 \text{ tens and } 3 \text{ ones} \\ &= 63 \end{aligned}$$

(c)
$$\begin{array}{r} 1 \\ 34 \\ + 29 \\ \hline 63 \end{array}$$

Examples (a) and (b) were used previously to develop understanding. Example (c) is the form that students use in computation.

The measurement topics that are included in HMS Book 4 have been interspersed in Chapters 2, 5, 6, 9, and 10. They were scattered in this fashion because there is such a great amount of material; measurement topics lend themselves nicely to “doing” and can therefore balance a predominantly “paper and pencil” chapter; with careful placement, measurement lessons can readily demonstrate application of a newly acquired skill. You will therefore find the likes of decimals — linear units of measurement, graphing — temperature, and multiplication — area and volume, occurring together in the text.

This chapter presents and reviews metric units of linear measurement (millimetre, centimetre, decimetre, metre, kilometre) and their interrelationships. Furthermore, plenty of opportunities are provided to develop personal referents (i.e., my fingernail is about 1 cm wide, the park is about 1 km from the school, etc.), perform linear measurements, choose appropriate units, and solve measurement word problems. It is hoped that the suggested lesson activities will find a place in your teaching approach.

MATERIALS

base-ten blocks
30 cm rulers or student number lines
rulers marked in millimetres, centimetres, decimetres
metrestick (or tape) marked in decimetres
sufficient cord to make a 1 m cord per group
a 100 m cord

CAREER AWARENESS

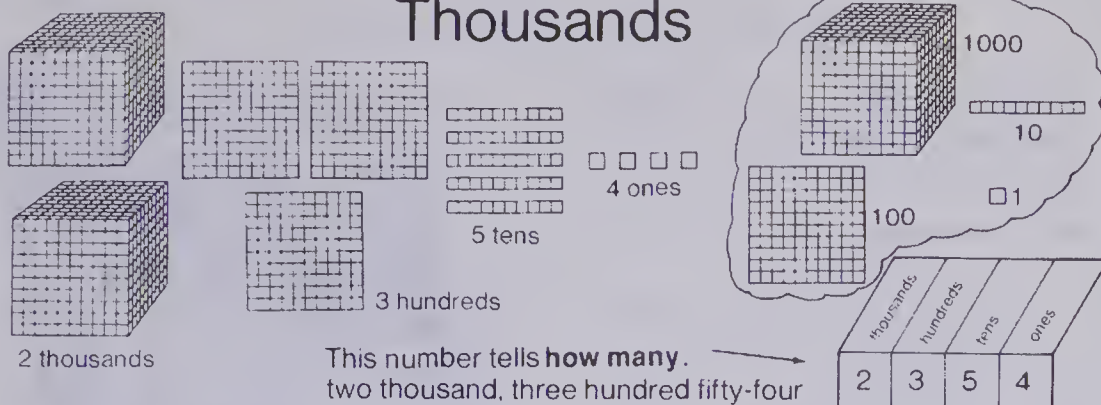
Zoo Keeper [40]

A zoo keeper is generally responsible for the well-being of all the animals. He or she must hire staff members who have knowledge about a wide variety of animals. The keeper arranges to have new, and sometimes, exotic animals captured in the wild and brought to a new home at the zoo. Plans must be carefully made to provide an appropriate environment for each type of animal.

Money to maintain the zoo and to provide proper food and medical care usually comes in part from the government. The remainder comes from admission fees charged to the public.

People are encouraged, through advertising, to come, see and learn about animals that have been brought from many parts of the world.

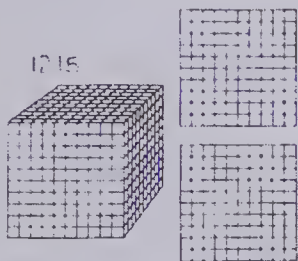
Thousands



Exercises

1. Write numbers for these.

(a) 1215



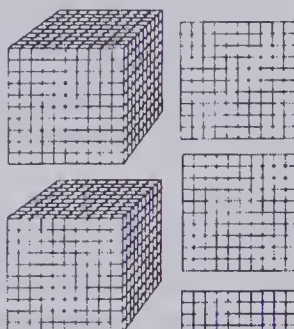
6 thousands
5 hundreds
0 tens
2 ones

2 thousands
4 hundreds
8 tens
5 ones

6502

2485

(b)



2308

2308

(e) 5 thousands

2 hundreds
4 tens
0 ones

5240

2. Write numbers for these.

● six thousand, two hundred forty-seven 6247

(b) nine thousand, sixty-four 9064

(c) four thousand, eight hundred nineteen 4819

(d) two thousand, five hundred 2500

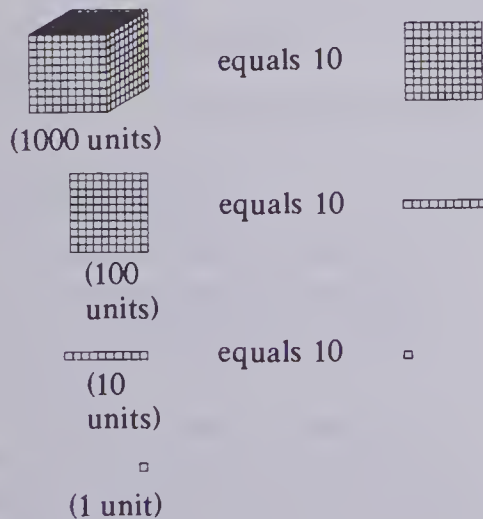
4-digit place value 33

Using the Book You may wish to use this page as a cooperative class activity. Some students could record their answers on the chalkboard.

SUGGESTIONS

Initial Activity Using the base-ten blocks, lead students to name the number of units in each model and the relationships among the models.

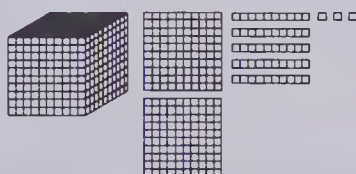
Example



Have students use the models to make representations of numbers. Relate these numbers to a place-value

chart. Provide opportunities to read the numbers.

Example



"This represents the number 1253. It is read as one thousand, two hundred fifty-three."

ACTIVITIES

1. Play "The P.V. Game" as described in the Activity Reservoir.
2. Ask students to complete challenges similar to the following:
"Write a 4-digit number with a 7 in the hundred's place."
"Write a 4-digit number with a 0 in the one's place."
"Write the greatest 4-digit number with a 5 in the ten's place."
3. Prepare puzzles similar to this one. Encourage students to construct their own. (Answers are given.)

OBJECTIVE

To extend place value to the thousands

PACING

Level A All
Level B All
Level C All

VOCABULARY

thousand(s)

MATERIALS

base-ten blocks

RELATED AIDS

CALC. W/BK—2.

BACKGROUND

Please note that, when writing whole numbers with 5 or more digits, the SI metric method of notation calls for the use of a space (not a comma) to separate sets of three digits. In 4-digit whole numbers, the space is optional. Therefore, the space is not used for 4-digit numbers in this book unless they appear as part of greater numbers in column addition.

Example

(a) 4275 (b) 36 809
+ 4 275

Note as well that the word "and" is not used. "And" is reserved for the decimal point as in \$20.50 ("twenty dollars and fifty cents") or 7.3 ("seven and three tenths").

With this in mind, you may want to construct a bulletin board place-value chart which can be extended to include "ten thousands" and "hundred thousands" for subsequent lessons.

a	4	b	2	c	5	1	
		d	2		9		e
f	6		7		8		0
	3						5
g	4		6		0	5	

ACROSS

- a 4 thousands, 2 hundreds, 5 tens, 1 one
d 8 + 8 + 2 + 2 + 9
f 8 ones + 7 tens + 6 hundreds
g 4000 + 600 + 0 + 5

DOWN

- b 200 + 20 + 7
c 600 - 2 = ■
e 30 tens, 5 ones
f six hundred thirty-four

OBJECTIVE

To extend place value to ten thousands

PACING

Level A All
Level B All
Level C All

VOCABULARY

ten thousands

SUGGESTIONS

Initial Activity Using a place-value chart drawn on the chalkboard, have students write in numbers similar to the one used in the display. Include zeros in your examples.

You may wish to play "The P.V. Game" as described in the Activity Reservoir. Ask, "Why do you think you have the greatest number?", "What is the greatest number that can be made with these five digits?", etc. This activity not only reinforces the concept of place value, it also provides a framework for the comparison of numbers (pages 35 and 36).

ACTIVITIES

1. If you have not played "The P.V. Game" in the introduction, consider using the game as a follow-up activity.

2. Children might enjoy creating a "Number Bulletin Board" composed of newspaper and magazine headlines as suggested from the display.

3. If you have one or more mini-calculators, children might enjoy trying "The Great Disappearing Act".
(a) Select any number (e.g., 35 167) and enter it in the machine. (b) Remove any digit (e.g., 5) from the number, replacing it with a zero. The rest of the number must not be altered (e.g., $35\ 167 - 5\ 000 = 30\ 167$). (c) Continue to remove single digits in this manner until the original number disappears!

Headlines

48 792 is read as:

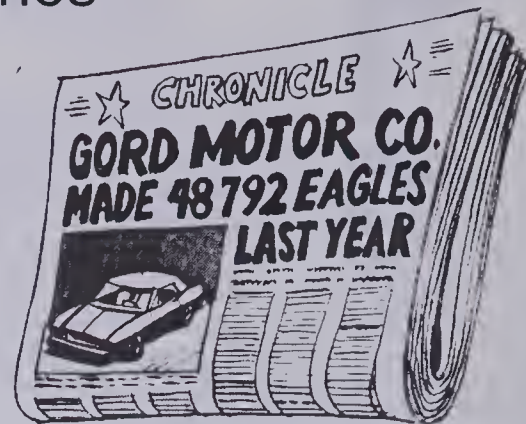
"forty-eight thousand, seven hundred ninety-two".

Place-value chart:

ten thousands	thousands	hundreds	tens	ones
4	8	7	9	2

Meaning:

4 ten thousands, 8 thousands, 7 hundreds, 9 tens, 2 ones.



Exercises

Write numbers for these.

- 5 ten thousands, 2 thousands, 0 hundreds, 0 tens, 0 ones. 52 000
2. 3 ten thousands, 6 thousands, 0 hundreds, 5 tens, 2 ones. 36 052
3. 7 ten thousands, 0 thousands, 9 hundreds, 4 tens, 6 ones. 70 946

Write the numbers for these.

4. twenty-seven thousand, four hundred ninety-three 27 493
5. fifty-eight thousand 58 000
6. fifty-eight thousand, sixty-three 58 063
7. seventy-two thousand, five hundred four 72 504
8. sixty-one thousand, two hundred nineteen 61 219

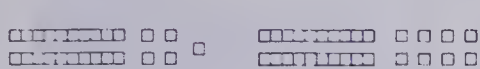
Give the value of each underlined digit.

- 5 hundreds 8 ten thousands 2 tens 4 thousands
- 37 526 10. 86 051 11. 43 921 12. 54 108

34 Place value 5 digits

Using the Book As in the previous lessons, you may want to use this page as a class activity.

Comparing Numbers



Let's compare

25 and 28

2 tens 5 ones
 ↘ same ↗
 2 tens 8 ones

25 is less than 28.
 $25 < 28$



Let's compare

37 and 32

3 tens 7 ones
 ↘ same ↗
 3 tens 2 ones

37 is greater than 32.
 $37 > 32$

When numbers are the same we use "equals".
 17 equals 17.
 $17 = 17$

Exercises

Compare. Use =, <, or >.

1. $14 \bullet 10 >$ 2. $23 \bullet 29 <$ 3. $12 \bullet 12 =$ 4. $48 \bullet 40 >$
 5. $18 \bullet 29 <$ 6. $19 \bullet 21 <$ 7. $35 \bullet 27 >$ 8. $24 \bullet 24 =$
 9. $52 \bullet 46 >$ 10. $30 \bullet 61 <$ 11. $65 \bullet 65 =$ 12. $48 \bullet 41 >$

Compare. Use =, <, or >.

13. 237 and 251
 2 hundreds 3 tens 7 ones
 ↘ same ↗
 2 hundreds 5 tens 1 one
 $237 < 251$
14. $382 \bullet 359 >$ 15. $508 \bullet 578 <$
 16. $231 \bullet 231 =$ 17. $374 \bullet 347 >$
 18. $682 \bullet 614 >$ 19. $425 \bullet 425 =$
 20. $248 \bullet 261 <$ 21. $539 \bullet 532 >$
 22. $309 \bullet 342 <$ 23. $591 \bullet 573 >$

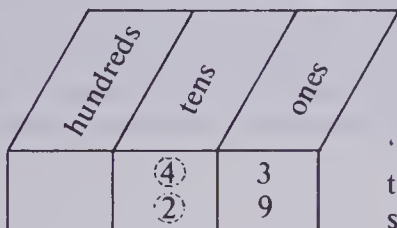
Comparing numbers 35

Using the Book As students work on the exercises, watch for errors. By talking with individual students establish whether the difficulty is caused by an incomplete understanding of place value, or whether the symbols (>, <) are causing problems.

If it is the former, provide students with a place-value model to help them.

Example

43 • 29 →



"4 tens are more than 2 tens so $43 > 29$."

If it is the latter, permit students to use the words rather than the symbols.

Example

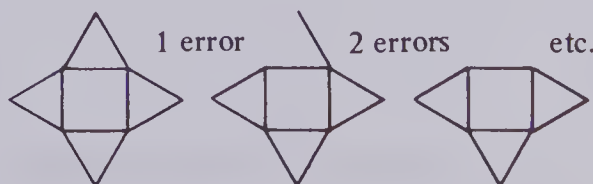
43 • 29 → 43 is greater than 29.

ACTIVITIES

1. To provide further practice with place value and notation, play "Who Am I?" as described in the Activity Reservoir, extended to include ten thousands.

2. Play the game "4-Star Caper" which can be played by competing teams or individuals. Provide a series of questions similar to those in Exercises 14-23. For each incorrect response, a line of the star is erased. Winners are those individuals or teams that have the

greatest portion of the star intact.
Example



3. Remove the face cards from a deck of playing cards to play "Greatest and Least". Each player in turn draws 3 cards with which he or she makes the greatest and least possible numbers.

OBJECTIVE

To compare numbers up to the hundreds using the symbols =, <, or >

PACING

Level A 1-10, 14-20

Level B All

Level C All

VOCABULARY

equals (=), greater than (>), less than (<), compare

MATERIALS

30 cm rulers or student number lines, chalkboard number line

SUGGESTIONS

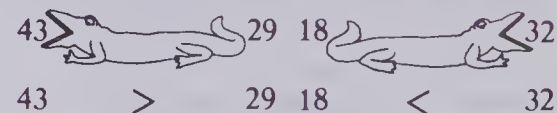
Initial Activity Provide students with 30 cm rulers or dittoed number lines. Establish the idea that the relative value of one number to another will depend on its position on the ruler or number line. You might use number pairs to generate some oral practice. For example, Teacher: "(8, 3)"; Student: "Eight is greater than three." An important point to emphasize is that we compare the first number to the second.

Allow students to use the number line (or rulers) as a reference in the initial exercise, then encourage them to visualize the line in their minds. At this point, ask students to write their answers using the correct symbol.

If students have difficulty distinguishing between > and < symbols, use a device similar to this one.

"Alvin Alligator goes for the big ones!"

Example



43 is greater than 29. 18 is less than 32.

Establish with students the procedure for comparing numbers as demonstrated in the display. Include examples in the hundreds as in Exercise 13.

The numbers should be recorded, e.g., Cards: 724 → 742 > 247

Variations: (a) Draw 3 cards. Player with number closest to 999 wins.

(b) Draw 4 cards, or 5 cards to increase the challenge.

OBJECTIVE

To compare numbers up to the thousands using the symbols $=$, $<$, or $>$

PACING

Level A 1-12, 16-19
Level B All
Level C All

RELATED AIDS

HMS—DM9.

SUGGESTIONS

Initial Activity Briefly review lesson. Use chalkboard examples similar to the one in the display on page 35. Emphasize the procedure used to compare pairs of digits.

ACTIVITIES

1. Play the game "4-Star Caper", extending the questions to include 4-digit numbers (see 4-Star Caper, page 35, as described in Activity 2).

2. Emphasize the examining of the value of a digit in its place by writing examples like the following on the chalkboard.

— 8 — —
— 3 — —

Ask the students which number is greater (or less) *so far*. Encourage them to explain the reason for their choice (e.g., "The '8' represents 800, while the '3' represents 300. I know that $800 > 300$, therefore the top number is the greatest so far.").

Vary and mix the place and the number of digits showing.

3. Ask students to collect newspaper and magazine clippings or headlines that contain numbers. Once collected, they could be displayed on a bulletin board in order from least to greatest. An alternative would be to place each number on a piece of cardboard to be used by those students requiring extra practice in comparison of numbers.

EXTRA PRACTICE

HMS—DM9.

Let's Compare

5862 and 5827

5 thousands
same
5 thousands

8 hundreds
same
8 hundreds

6 tens
greater
2 tens

2 ones
7 ones

$5862 > 5827$

Exercises

Compare. Use $=$, $>$, or $<$.

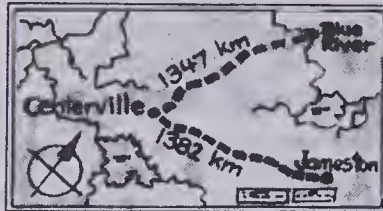
- | | | |
|---------------------|--------------------|--------------------|
| 1. 5243 ● 5261 $<$ | 2. 3860 ● 3265 $>$ | 3. 6275 ● 5896 $>$ |
| 4. 3982 ● 4261 $<$ | 5. 7324 ● 7324 $=$ | 6. 5837 ● 5783 $>$ |
| 7. 27 ● 27 $=$ | 8. 446 ● 464 $<$ | 9. 312 ● 299 $>$ |
| 10. 4253 ● 4067 $>$ | 11. 45 ● 54 $<$ | 12. 958 ● 975 $<$ |
| 13. 6841 ● 6088 $>$ | 14. 499 ● 994 $<$ | 15. 808 ● 886 $<$ |

Solve.

16. John's mass is 48 kg.
Jim's mass is 51 kg.
Who is heavier? Jim

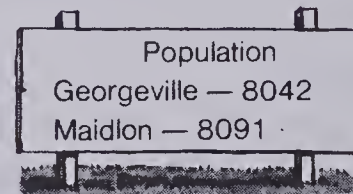
17. Susan's height is 112 cm.
Brenda's height is 108 cm.
Who is taller? Susan

18.



Which distance is greater?
Centerville to Jamestown (1382 km)

19.

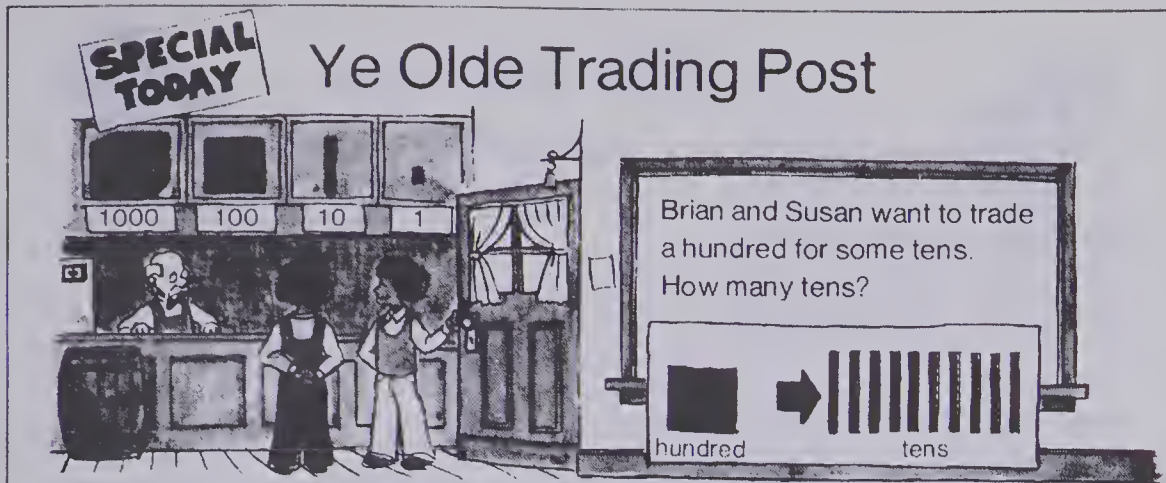


Which population is larger? Maidlon's population

36 Comparing numbers

Using the Book Before assigning the page, be sure that students understand the meaning of the symbols $>$ and $<$. Be certain that the students are familiar with the accepted answer format, especially for Exercises 16-19.

Level A students should be encouraged to finish their assignments so that they might take part in some of the Activities. Many of the Activities actually consist of more practice in alternate and/or more appealing formats. Hence, the "Pacing" information sometimes suggests reduced assignments for various levels of students as encouragement and motivation to finish so that they may proceed to the Activities.



OBJECTIVE

To develop an exchange procedure in preparation for regrouping in addition

PACING

Level A All
Level B All
Level C All

MATERIALS

base-ten blocks

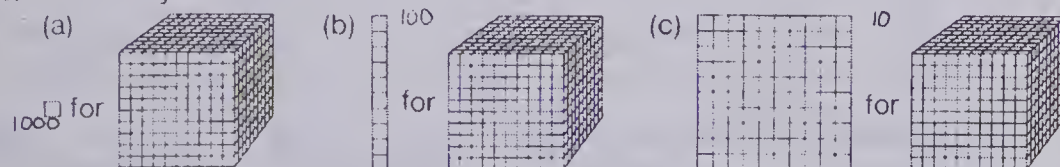
SUGGESTIONS

Initial Activity Use the base-ten blocks to develop the "exchange rates" among the various models as suggested by the display.

Exercises

Help Brian and Susan trade these.

1. How many tens for a hundred? 10
2. How many hundreds for a thousand? 10
3. How many?



How many *hundreds* can Susan get for the following?

4. 13 tens 1
6. 29 tens 2

Hundreds	Tens left over
1	3

5. 20 tens 2
7. 57 tens 5

How many *thousands* can you get for the following?

8. 16 hundreds 1
10. 62 hundreds 6

Thousands	Hundreds left over
1	6

9. 38 hundreds 3
11. 40 hundreds 4

Renaming 37

Using the Book You may want to use Exercises 1-3 as a class activity. Assign Exercises 4-11 as independent work.

ACTIVITIES

1. Provide challenges similar to those listed below. Encourage students to discuss the various strategies used. "Are the two names the same?"

(a)

thousands	hundreds	tens	ones
4	0	0	2
3	9	9	12

(yes)

$$(3000 + 900 + 90 + 12 = 4002)$$

(b)

thousands	hundreds	tens	ones
6	4	1	3
5	9	40	13

(no)

$$(5000 + 900 + 400 + 13 = 6313)$$

2. Play "Who Am I?" as described in the Activity Reservoir.

EXTRA PRACTICE

1. Provide students with an exercise similar to this:
"Exchange each of these."

	thousands	hundreds	tens	ones	
13 tens →		1	3		→ 1 hundred → 3 tens
26 hundreds →		2	6		→ 2 thousands → 6 hundreds

2. To reinforce the relationship among the place values, provide an exercise similar to this:

- (a) 10 tens = ____ hundred(s).
- (b) 100 ones = ____ tens.
- (c) 40 hundreds = ____ thousands.
- (d) 60 tens = ____ hundreds.
- (e) 500 tens = ____ hundreds
= ____ thousands.

OBJECTIVE

To add 3- and 4-digit whole numbers with regrouping

PACING

Level A All
Level B All
Level C All

RELATED AIDS

BFA COMP LAB II—7, 10.

SUGGESTIONS

Initial Activity Briefly review the work done on page 19, i.e., 3-digit addition with regrouping. Extend examples to include addition with thousands. Relate the work done on the previous page with "exchange rates" to the regrouping process demonstrated in the display.

Example

(a)
$$\begin{array}{r} 968 \\ + 456 \\ \hline 4 \end{array}$$
 $6 + 8 = 14 \text{ ones}$
(1 ten and 4 ones)

(b)
$$\begin{array}{r} 968 \\ + 456 \\ \hline 24 \end{array}$$
 $5 + 6 + 1 = 12 \text{ tens}$
(1 hundred and 2 tens)

(c)
$$\begin{array}{r} 968 \\ + 456 \\ \hline 1424 \end{array}$$
 $4 + 9 + 1 = 14 \text{ hundreds}$
(1 thousand and 4 hundreds)


ACTIVITIES

1. Place the "Addition Boxes" on the chalkboard or a dittoed sheet. Be sure students understand the instructions. (Please refer to Activity 2, page 19.) (Answers are given in brackets.)

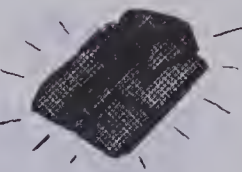
- (a) Add across.
(b) Add down.

A			B		
+			+		
36	45	(81)	253	319	(572)
28	53	(81)	417	385	(802)
(64)	(98)	(?)	(670)	(704)	(1374)

2. Play "Almost 100". Each player rolls an ordinary commercial die 7 times. After each roll, the player records the number shown on the die in the one's or ten's column of the chart as shown below. Winner is that player which comes nearest to 100 after 7 rolls.



The Great Shirt Sale



Brenda uses a *short form*.

968 shirts sold in the first week.
456 shirts sold in the second week.
How many shirts sold altogether?

Add ones. Add tens. Add hundreds.

968 + 456 ----- 4	968 + 456 ----- 24	968 + 456 ----- 1424
----------------------------	-----------------------------	-------------------------------

There were 1424 shirts sold altogether.

Exercises

1. Add, using the short form.

● 827 + 388 ----- 1215	● 968 + 579 ----- 1547	(c) 265 + 186 ----- 451	(d) 727 + 895 ----- 1622	(e) 648 + 546 ----- 1194
(f) 805 + 688 ----- 1493	(g) 573 + 567 ----- 1140	(h) 615 + 685 ----- 1300	(i) 725 + 492 ----- 1217	(j) 805 + 999 ----- 1804

2. Ann is adding thousands. Help her finish.

Add ones.	Add tens.	Add hundreds.	Add thousands.
$\begin{array}{r} 2685 \\ + 1936 \\ \hline 1 \end{array}$	$\begin{array}{r} 2685 \\ + 1936 \\ \hline 21 \end{array}$	$\begin{array}{r} 2685 \\ + 1936 \\ \hline 621 \end{array}$	$\begin{array}{r} 2685 \\ + 1936 \\ \hline 4?621 \end{array}$

3. ● 3657 ● 4738 (c) 6291 (d) 5547 (e) 2356

+ 2785	+ 3455	+ 2659	+ 2786	+ 662
-----	-----	-----	-----	-----
6442	8193	8950	8333	3018

38 Adding 3- and 4-digit numbers with regrouping

Using the Book As noted above, the example in the display uses "helper numbers" to indicate that renaming or regrouping has taken place. By now some students may be regrouping mentally. Encourage other students as they work through the exercises to conduct the regrouping process mentally. A few students may require the use of "helper numbers" for a while yet.

Variation:

Extend the game to "Almost 400". Rules are as above, but extend the chart as shown below.

Sample Play:

Hundreds	Tens	Ones
1		
	5	
1		
	4	
	6	
	3	
		4

$$200 + 180 + 4 = 384$$

Sample Play:

Tens	Ones
	3
2	
	6
	1
4	
	4
2	

$$80 + 14 = 94$$

Encourage students to discuss the various strategies used.

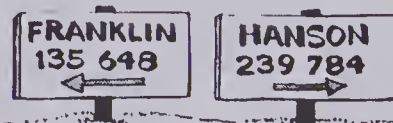
Twin Cities

Franklin and Hanson are twin cities.

What is the total population?

Use the short form to add.

$$\begin{array}{r} 135\ 648 \\ + 239\ 784 \\ \hline 375\ 432 \end{array}$$



The total population is 375 432.

hundred thousands	ten thousands	thousands	hundreds	tens	ones
3	7	5	4	3	2

Meaning:

3 hundred thousands, 7 ten thousands, 5 thousands, 4 hundreds, 3 tens, 2 ones.

Exercises

Add to find the total population in these twin cities.

1. Walker 27 058
Belmont 38 173 *65 231*
2. Melrose 135 217 *365 062*
Rockville 229 845
3. Westwood 216 304 *535 728*
Fenton 319 424
4. Greenwood 47 065 *482 361*
Fairbury 435 296
5. 23 406 + 37 219 = *60 625*
6. 350 497 + 24 831 = *375 328*
7. 42 504 + 21 910 = *64 414*
8. 435 481 + 30 842 = *466 323*
9. 61 420 + 29 832 = *91 252*
10. 740 521 + 237 891 = *978 412*
11. 27 651 + 10 862 = *38 513*
12. 547 197 + 238 045 = *785 242*
13. What is the value of each digit?
- (a) 354 672 (b) 178 235 (c) 821 034 (d) 594 071

Hundred thousands addition 5 6 digits with regrouping 39

Using the Book Read through the information in the display, relating the number 375 432 as it appears as a sum, in the place-value chart, and under the heading "Meaning". Assign the exercises.

OBJECTIVE

To add 5- and 6-digit whole numbers with regrouping

PACING

Level A All
Level B All
Level C All

VOCABULARY

population

RELATED AIDS

HMS—DM10.
BFA COMP LAB II—12.

SUGGESTIONS

Initial Activity You may wish to briefly review the ideas covered during the previous lesson. Again, encourage the students to regroup mentally.

ACTIVITIES

1. Play the game "Greatest Sum — Least Sum", as illustrated on page 19, Activity 1. The game reinforces skills with place value, comparison, and addition.
2. Some students might enjoy checking their work using the unitate method. Please refer to the "Checking Activity" outlined in Activity 1 on page 26.
3. Write the following list of numbers on the board and ask students to construct a magic square whose "magic sum" (i.e., sums horizontally, vertically, and diagonally) is 57. Provide a starting number. Numbers may be used only once. (Answers are given in brackets.)
3, 7, 11, 15, 19, 23, 27, 31, 35

(31)	3	(23)
(11)	(19)	(27)
(15)	(35)	(7)

EXTRA PRACTICE

HMS — DM10.

ANSWERS

13. (a) 3 hundred thousands, 5 ten thousands, 4 thousands, 6 hundreds, 7 tens, 2 ones
(b) 1 hundred thousand, 7 ten thousands, 8 thousands, 2 hundreds, 3 tens, 5 ones (c) 8 hundred thousands, 2 ten thousands, 1 thousand, 0 hundreds, 3 tens, 4 ones (d) 5 hundred thousands, 9 ten thousands, 4 thousands, 0 hundreds, 7 tens, 1 one

OBJECTIVES

To select appropriate data from a chart
To solve word problems

PACING

Level A All
Level B All
Level C All

BACKGROUND

See Career Awareness in the Chapter Overview, page 32.

SUGGESTIONS

Initial Activity You may want to use the picture in the display as a basis for discussion with the class, e.g., "How many have been to a zoo? What kinds of animals are at a zoo? What is your favourite animal? Why do we have zoos? Who is responsible for the well-being of the animals?"

ACTIVITIES

1. Students might enjoy collecting and displaying facts about animals. (Books about world records contain an ample supply of fascinating data.)

Example

Animals — the heaviest, the biggest, the smallest, the fastest, the rarest, etc.

2. You may want to have students collect data charts found in catalogues, almanacs, newspapers, etc. Children could pose two or three simple questions based on their charts to the rest of the class.

3. Find the "cost" of various animals. Provide a value for each letter of the alphabet.

Example

A = 1, B = 2, C = 3, D = 4, ..., Z = 26

Assign these values to each letter in a word, then add to find the total value.

Example

L I O N
 $12 + 9 + 15 + 14 = 50$
∴ Lion is worth 50.

T I G E R
 $20 + 9 + 7 + 5 + 18 = 59$
∴ Tiger is worth 59.

What is the cost of HIPPOPOTAMUS, GIRAFFE? What animal costs the most? the least?

Variation: Ask, "Can you make up an animal that is worth 85? e.g., ZONKS."

Zoo Keeper

Day	Number of Visitors
Monday	1286
Tuesday	1267
Wednesday	2908
Thursday	2784
Friday	2687
Saturday	3565



- What day had the least number of visitors? Tuesday
 - What day had the greatest number of visitors? Saturday
- How many visitors altogether?
 - on Monday and Wednesday 4194
 - on Wednesday and Friday 5595
 - on Tuesday and Saturday 4832
 - on Thursday and Friday 5471
- Popcorn sales*
463 boxes on Thursday.
389 boxes on Friday.
How many boxes of popcorn altogether? 852
- Soft-drink sales*
368 soft drinks on Friday.
537 soft drinks on Saturday.
How many soft drinks altogether? 905
- Animal feed*
1765 kg of feed on Tuesday.
1847 kg of feed on Friday.
How many kilograms altogether? 3612 kg
- Polar-bear pool*
2307 L of clean water on Wednesday.
2897 L of clean water on Saturday.
How many litres of clean water altogether? 5204 L

40 Problem solving, adding 3- and 4-digit numbers

Using the Book Do Exercise 1 orally with the students. Ask students how they would solve Exercise 2(a), noting that the "facts" are in the chart. Two skills are required of students here. First they must move from the question to the data chart, selecting the appropriate information. Secondly, they must transfer this information back to the question.

Before assigning the remaining exercises, remind students about the four questions of Professor Q (done mentally now by most students), and review, if necessary, the problem-solving format you have established in your classroom.

Home Show

Peggy recorded the attendance for the Masonville Home Show.

Thursday — 568

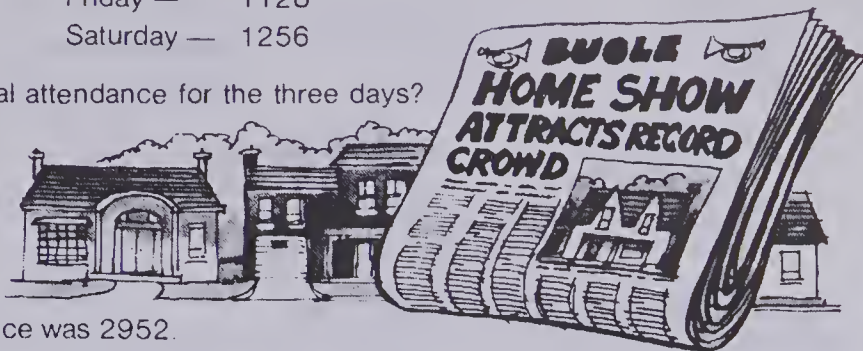
Friday — 1128

Saturday — 1256

What was the total attendance for the three days?

$$\begin{array}{r} \text{Add: } 568 \\ 1128 \\ + 1256 \\ \hline 2952 \end{array}$$

The total attendance was 2952.



Exercises

Add these attendance numbers.

$$\begin{array}{r} 1024 \\ 957 \\ + 2370 \\ \hline 4351 \end{array}$$

$$\begin{array}{r} 251 \\ 3098 \\ + 1473 \\ \hline 4822 \end{array}$$

$$\begin{array}{r} 51204 \\ 2911 \\ + 1877 \\ \hline 55992 \end{array}$$

$$\begin{array}{r} 418 \\ 3710 \\ + 2109 \\ \hline 6237 \end{array}$$

$$\begin{array}{r} 2443 \\ 518 \\ + 1679 \\ \hline 4640 \end{array}$$

$$\begin{array}{r} 235104 \\ 11632 \\ + 9834 \\ \hline 256570 \end{array}$$

$$\begin{array}{r} 24010 \\ 241495 \\ + 12918 \\ \hline 278423 \end{array}$$

$$\begin{array}{r} 595 \\ 218 \\ + 1362 \\ \hline 2175 \end{array}$$

3 addends 41

Using the Book Use the display to demonstrate addition of three addends. Have students explain why the number 568 is placed as it is in the column, (i.e., corresponding place value).

Assign the page.

OBJECTIVE

To add three 3-, 4-, 5-, and 6-digit whole numbers with regrouping

PACING

Level A All

Level B All

Level C All

VOCABULARY

total

RELATED AIDS

HMS—DM10.

BFA COMP LAB II—9.

BFA PROB. SOLVING LAB II—31, 37.

CALC. W/BK—3.

ACTIVITIES

1. Children might enjoy practising addition skills by playing the game "Quad-Row" as described in the Activity Reservoir in the front of the book.

2. Write this list of numbers on the board with the following instructions: "Arrange these numbers in sets of three each so that the sum of the three numbers is 600." (Answers are given in brackets.)

99, 359, 316, 49, 214, 120, 121, 287, 235
 (121 + 359 + 120 = 600)
 (316 + 235 + 49 = 600)
 (214 + 99 + 287 = 600)

3. See the Fact-Folder idea in the Activity Reservoir.

EXTRA PRACTICE

1. Provide horizontal examples that students must rewrite vertically.

Example

(a) $134 + 2580 + 216$

(b) $5209 + 243 + 96$

(c) $27 + 6215 + 119$

Have students use their place-value skills rather than "zero placeholders" to properly align the numbers.

Example

$28 + 1563$	→	This	Not this
		28	0028
		+ 1563	+ 1563

2. HMS—DM10.

OBJECTIVE

To subtract 4-digit whole numbers with regrouping

PACING

Level A 1-18

Level B All

Level C All

RELATED AIDS

BFA COMP LAB II—24.

BFA PROB. SOLVING LAB II—34,
38, 169.

SUGGESTIONS

Initial Activity (a) Provide varied practice in subtraction with regrouping. Include some zeros in your examples.

Example

1.
$$\begin{array}{r} \overset{3}{\cancel{7}}\overset{1}{5}\overset{1}{4}\overset{6}{8} \\ - 3128 \\ \hline 4418 \end{array}$$
 Regrouping from tens to ones

2.
$$\begin{array}{r} \overset{7}{\cancel{6}}\overset{1}{0}\overset{5}{5} \\ - 2163 \\ \hline 4642 \end{array}$$
 Regrouping from hundreds to tens

3.
$$\begin{array}{r} \overset{5}{\cancel{6}}\overset{1}{2}\overset{5}{8} \\ - 3807 \\ \hline 2451 \end{array}$$
 Regrouping from thousands to hundreds

4.
$$\begin{array}{r} \overset{9}{\cancel{9}}\overset{1}{0}\overset{1}{3} \\ - 4825 \\ \hline 4678 \end{array}$$
 Two or more regroupings

(b) Use the example in the display.

ACTIVITIES

- Introduce students to "Magic 6174".
- (a) Select any 4-digit number (e.g., 2783) where no two digits are the same.
- (b) By rearranging the digits, make the greatest and the least numbers, then subtract.

Example

(1)
$$\begin{array}{r} 8732 \\ - 2378 \\ \hline 6354 \end{array}$$

(c) Using the difference continue the process. In 7 or fewer steps you make "Magic 6174"!

(2)
$$\begin{array}{r} 6543 \\ - 3456 \\ \hline 3087 \end{array}$$

(3)
$$\begin{array}{r} 8730 \\ - 0378 \\ \hline 8352 \end{array}$$

Gone Fishing



5264 fish in Walpur's Lake.

3628 fish in Shallow Lake.

How many more fish in Walpur's Lake?

$$\begin{array}{r} 5264 \\ - 3628 \\ \hline \end{array}$$

(a) Rename if necessary and subtract ones.

$$\begin{array}{r} \overset{5}{\cancel{5}}\overset{1}{2}\overset{1}{6}\overset{4}{4} \\ - 3628 \\ \hline 6 \end{array}$$

(b) Rename if necessary and subtract tens.

$$\begin{array}{r} \overset{5}{\cancel{5}}\overset{1}{2}\overset{1}{6}\overset{4}{4} \\ - 3628 \\ \hline 36 \end{array}$$

(c) Rename if necessary and subtract hundreds.

$$\begin{array}{r} \overset{4}{\cancel{5}}\overset{1}{2}\overset{1}{6}\overset{4}{4} \\ - 3628 \\ \hline 636 \end{array}$$

(d) Subtract thousands.

$$\begin{array}{r} \overset{1}{\cancel{5}}\overset{1}{2}\overset{1}{6}\overset{4}{4} \\ - 3628 \\ \hline 1636 \end{array}$$

There are 1636 more fish in Walpur's Lake.

Exercises

1. $\begin{array}{r} 6528 \\ - 2164 \\ \hline 4364 \end{array}$	2. $\begin{array}{r} 7256 \\ - 3524 \\ \hline 3732 \end{array}$	3. $\begin{array}{r} 5843 \\ - 2266 \\ \hline 3577 \end{array}$	4. $\begin{array}{r} 4262 \\ - 3471 \\ \hline 791 \end{array}$	5. $\begin{array}{r} 8655 \\ - 4221 \\ \hline 4434 \end{array}$
6. $\begin{array}{r} 8650 \\ - 4221 \\ \hline 4429 \end{array}$	7. $\begin{array}{r} 6420 \\ - 3502 \\ \hline 2918 \end{array}$	8. $\begin{array}{r} 9520 \\ - 132 \\ \hline 9388 \end{array}$	9. $\begin{array}{r} 3160 \\ - 1111 \\ \hline 2049 \end{array}$	10. $\begin{array}{r} 6803 \\ - 212 \\ \hline 6591 \end{array}$
11. $\begin{array}{r} 3805 \\ - 964 \\ \hline 2841 \end{array}$	12. $\begin{array}{r} 4203 \\ - 2076 \\ \hline 2127 \end{array}$	13. $\begin{array}{r} 9502 \\ - 4603 \\ \hline 4899 \end{array}$	14. $\begin{array}{r} 7058 \\ - 5117 \\ \hline 1941 \end{array}$	15. $\begin{array}{r} 4043 \\ - 1760 \\ \hline 2283 \end{array}$
16. $\begin{array}{r} 8072 \\ - 5094 \\ \hline 2978 \end{array}$	17. $\begin{array}{r} 3044 \\ - 145 \\ \hline 2899 \end{array}$	18. $\begin{array}{r} 3004 \\ - 2287 \\ \hline 717 \end{array}$	19. $\begin{array}{r} 7500 \\ - 5312 \\ \hline 2188 \end{array}$	20. $\begin{array}{r} 9006 \\ - 734 \\ \hline 8272 \end{array}$

42 Subtracting 4-digit numbers

Using the Book Remind students that they will encounter these various forms of regrouping as they work through the exercises.

(4)
$$\begin{array}{r} 8532 \\ - 2358 \\ \hline 6174 \end{array}$$

(5)
$$\begin{array}{r} 7641 \\ - 1467 \\ \hline 6174 \end{array}$$

(Once "6174" is reached the round is finished because 6174 repeats itself as shown in (5).)

(d) Try other 4-digit numbers! Do they produce "6174"?

This exercise reinforces place value, comparison of numbers, and subtraction. The exercise is self-checking. If "6174" is not reached in 7 or fewer steps, an error has occurred somewhere.

2. Play the game "Bingo" as described in the Activity Reservoir. Use questions to reinforce basic addition and subtraction skills with regrouping, e.g., $14 + 8$, $21 - 9$, $7 + 19$, $15 - 8$, and so on.

EXTRA PRACTICE

Provide practice grids similar to the one below.

	56	81	72	60	92	51	73
28							
17			55				
30					62		
35							

"Copy and complete."

Passenger Ships



Terry likes ships.

He discovered that:

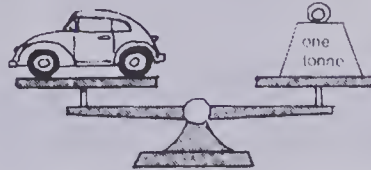
The Queen Elizabeth II has a mass of about 66 852 tonnes.

The Michelangelo has a mass of about 45 965 tonnes.

How much heavier is the Queen Elizabeth II?

Terry uses the *short form* to subtract.

$$\begin{array}{r} 17\ 14 \\ 5\ 1\ 12 \\ 66\ 852 \\ - 45\ 965 \\ \hline 20\ 887 \end{array}$$



The Queen Elizabeth is 20 887 tonnes heavier than the Michelangelo.

Exercises

Subtract to find out more about these ships.

● Canberra	44 817	2. France	66 348	3. Raffaello	45 933
Rotterdam	37 783	Victory	48 562	Windsor Castle	36 477
	7 034		17 786		9 456

Subtract.

$$\begin{array}{r} \bullet \quad 27\ 248 \\ - 18\ 713 \\ \hline 8\ 535 \end{array}$$

$$\begin{array}{r} \bullet \quad 52\ 617 \\ - 25\ 132 \\ \hline 27\ 485 \end{array}$$

$$\begin{array}{r} \bullet \quad 67\ 091 \\ - 42\ 427 \\ \hline 24\ 664 \end{array}$$

$$\begin{array}{r} 7. \quad 50\ 418 \\ - 16\ 249 \\ \hline 34\ 169 \end{array}$$

$$\begin{array}{r} 8. \quad 219\ 480 \\ - 112\ 726 \\ \hline 106\ 754 \end{array}$$

$$\begin{array}{r} 9. \quad 424\ 855 \\ - 319\ 265 \\ \hline 105\ 590 \end{array}$$

$$\begin{array}{r} 10. \quad 537\ 821 \\ - 23\ 042 \\ \hline 514\ 779 \end{array}$$

$$\begin{array}{r} 11. \quad 944\ 112 \\ - 418\ 112 \\ \hline 526\ 000 \end{array}$$

Subtraction 5 and 6 digits with regrouping 43

Using the Book Use the example in the display to demonstrate subtraction with 5-digit whole numbers. Notice that regrouping occurs twice in the ten's and hundred's places. As students work through the exercises, encourage them to perform the regrouping mentally wherever possible.

ACTIVITIES

1. If you have not already done so, try "The Great Disappearing Act" as described in Activity 3, page 34.
2. See the Fact-Folder idea as described in the Activity Reservoir.
3. Have the children play "Greatest Difference — Least Difference". The goal of this game is to find

the greatest (or least) possible difference between two numbers. The rules and equipment are the same as those used in "Greatest Sum — Least Sum" (see page 19) except that the operation is subtraction.

4. See HMS—DM12.

EXTRA PRACTICE

HMS—DM11 and DM12.

OBJECTIVE

To subtract 5- and 6-digit whole numbers with regrouping

PACING

Level A All
Level B All
Level C All

VOCABULARY

tonnes

RELATED AIDS

HMS—DM11 and DM12.

SUGGESTIONS

Initial Activity In order to review addition and subtraction skills, you may wish to use this number puzzle with your students.

1. Choose a number between 100 and 200 and write it on a piece of paper (e.g., 128).

2. Ask your students to choose any number between 200 and 1000, and to record their individual numbers (e.g., 837).

3. Secretly subtract your number from 999 (e.g., $999 - 128 = 871$).

4. Ask students to add this number to their recorded number (e.g., $871 + 837 = 1708$).

5. Ask students to cross out the thousand's digit and add it to their sum e.g.,

$$\begin{array}{r} \cancel{1}708 \\ + \quad 1 \\ \hline 709 \end{array}$$

6. Ask students to subtract this number from their original number (e.g., $837 - 709 = 128$).

7. Show the class your original number written on the piece of paper (128). It will be the same as the students, no matter what number they chose!

Students who do not have the required number have made an error somewhere in their calculations.

OBJECTIVE

To review and evaluate addition and subtraction of whole numbers with regrouping

PACING

Level A All
Level B All
Level C All

RELATED AIDS

If you have not already done so, see HMS—DM12.
BFA PROB. SOLVING LAB II—41, 42, 171, 211.

Tune Up

Add.

$$\begin{array}{r} 1. \quad 265 \\ + 352 \\ \hline 617 \end{array}$$

$$\begin{array}{r} 2. \quad 314 \\ + 429 \\ \hline 743 \end{array}$$

$$\begin{array}{r} 3. \quad 560 \\ + 274 \\ \hline 834 \end{array}$$

$$\begin{array}{r} 4. \quad 476 \\ + 309 \\ \hline 785 \end{array}$$

$$\begin{array}{r} 5. \quad 4375 \\ + 2852 \\ \hline 7227 \end{array}$$

$$\begin{array}{r} 6. \quad 6528 \\ + 1719 \\ \hline 8247 \end{array}$$

$$\begin{array}{r} 7. \quad 456 \\ + 3097 \\ \hline 3553 \end{array}$$

$$\begin{array}{r} 8. \quad 5370 \\ + 2861 \\ \hline 8231 \end{array}$$

$$\begin{array}{r} 9. \quad 27\,056 \\ + 38\,168 \\ \hline 65\,224 \end{array}$$

$$\begin{array}{r} 10. \quad 30\,875 \\ + 6\,797 \\ \hline 37\,672 \end{array}$$

$$\begin{array}{r} 11. \quad 49\,620 \\ + 32\,095 \\ \hline 81\,715 \end{array}$$

$$\begin{array}{r} 12. \quad 642\,968 \\ + 220\,553 \\ \hline 863\,521 \end{array}$$

Subtract.

$$\begin{array}{r} 13. \quad 428 \\ - 209 \\ \hline 219 \end{array}$$

$$\begin{array}{r} 14. \quad 652 \\ - 317 \\ \hline 335 \end{array}$$

$$\begin{array}{r} 15. \quad 735 \\ - 272 \\ \hline 463 \end{array}$$

$$\begin{array}{r} 16. \quad 407 \\ - 36 \\ \hline 371 \end{array}$$

$$\begin{array}{r} 17. \quad 8241 \\ - 3628 \\ \hline 4613 \end{array}$$

$$\begin{array}{r} 18. \quad 5042 \\ - 761 \\ \hline 4281 \end{array}$$

$$\begin{array}{r} 19. \quad 4730 \\ - 1815 \\ \hline 2915 \end{array}$$

$$\begin{array}{r} 20. \quad 6308 \\ - 4572 \\ \hline 1736 \end{array}$$

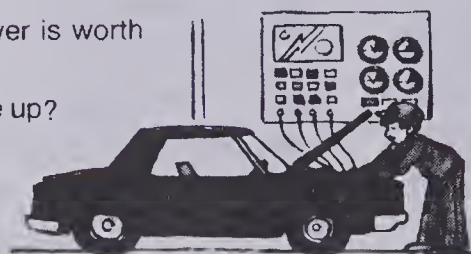
$$\begin{array}{r} 21. \quad 37\,251 \\ - 12\,573 \\ \hline 24\,678 \end{array}$$

$$\begin{array}{r} 22. \quad 72\,843 \\ - 37\,251 \\ \hline 35\,592 \end{array}$$

$$\begin{array}{r} 23. \quad 58\,310 \\ - 40\,652 \\ \hline 17\,658 \end{array}$$

$$\begin{array}{r} 24. \quad 542\,618 \\ - 219\,733 \\ \hline 322\,885 \end{array}$$

Each correct answer is worth
1 "tune up" point.
How was your tune up?



Tune Up Score Card

Points	Mechanic's Report
24-22	Excellent tune up!
21-19	Very good tune up!
18-17	Good tune up!
16-15	Fair tune up!
14-less	Time out for repairs

44 Drill: addition and subtraction

Using the Book This page can be used to provide you and each student with a picture of his/her overall achievement with addition and subtraction skills. The chart below provides you with percents to match the points used in the "Tune Up Score Card".

Points	Percents
24-22	100-91%
21-19	87-79%
18-17	75-70%
16-15	66-62%
14-less	58%-less

Also, each row can be evaluated to indicate mastery of a specific skill (e.g., Exercises 5-8, addition with 4-digit addends).

A score of 3 out of 4 (75%) or more in any row gives a strong indication that a student has mastered that skill. A score of 2 or less may indicate a need for remediation.

It is quite possible for a student to achieve 19 points (79%) on the score card, and yet require extra help with a specific skill in a particular row.

After the work is checked, students should correct any errors. The chart below shows where each topic was handled in the text.

Exercise	Topic	Page
1-4	3-digit addition with regrouping	19
5-8	4-digit addition with regrouping	38
9-12	5- and 6-digit addition with regrouping	39
13-16	3-digit subtraction with regrouping	24
17-20	4-digit subtraction with regrouping	42
21-24	5- and 6-digit subtraction with regrouping	43

The Fulton Island Ferry

1. The Fulton Island Ferry carried 2456 passengers in one week.
It carried 2839 passengers in another week.
How many passengers altogether?
5295

2. The ferry can carry cars.

Monday: 6 cars

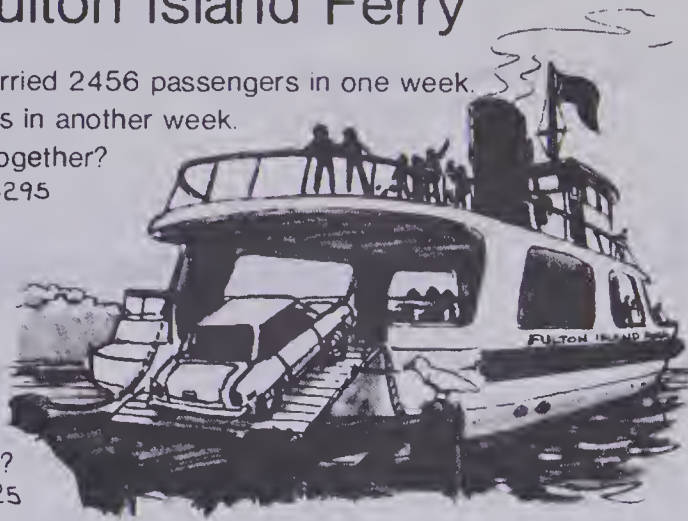
Tuesday: 2 cars

Wednesday: 5 cars

Thursday: 4 cars

Friday: 8 cars

How many cars altogether?
25



3. The ferry has room for 286 people on the upper deck and for 305 on the lower deck.

How many more people can the lower deck hold? 19

4. The ferry carries mail.

In June it carried 3043 letters and 1678 letters in July.

How many more letters were carried in June than July? 1365

5. The Fulton Island Ferry carries 348 life preservers on the lower deck and 316 on the upper deck.

How many life preservers are there altogether? 664

6. Some passengers bring their own bicycles.

The bow of the boat can hold 120 bicycles and the stern can hold 58 bicycles.

How many more will the bow hold than the stern? 62

Problems 45

OBJECTIVE

To solve word problems

PACING

Level A All

Level B All

Level C All

VOCABULARY

See notes below.

RELATED AIDS

HMS—DM12.

BFA PROB. SOLVING LAB II—39, 40, 45, 170, 210.

SUGGESTIONS

Initial Activity Review, if necessary, the four questions of Professor Q and the problem-solving format established in your classroom.

ACTIVITIES

1. The children might enjoy making up problems of their own. Supply them with cards and a "framework" to help them get started such as:

Make up 3 problems using these numbers:

1. 476, 1210
2. 5791, 365
3. 49 266, 1763

Have them write solutions on the back of each card. Use "only the best" in a classroom problem box.

2. Assign HMS—DM13.

Using the Book Use the picture on page 45 as a basis for discussion. Introduce terms used in the problems (e.g., deck, bow, stern). Encourage students to generate some of their own data about the Fulton Island Ferry (e.g., admission prices, distance from the mainland to Fulton Island, other things the ferry might carry, departure and arrival times, etc.).

Before assigning the problems, you may wish to read through the page as a group to ensure that reading comprehension is adequate.

OBJECTIVE

To provide computational practice

PACING

Level A Optional

Level B Optional

Level C Optional

VOCABULARY

vice versa, reverse

RELATED AIDS

HMS—DM12.

ACTIVITIES

If you have not already done so, you may wish to use HMS—DM12.

Vice-Versa Numbers

Vice-versa numbers read the same forward and backward.

646

53 135

(a) Select any number. 67

(b) Reverse the digits, then add. + 76

143

Repeat Step (b) until a vice-versa number appears! + 341

484

A vice-versa number is a **palindrome**.

Words like this are palindromes:

level

Use these to make vice-versa numbers.

1. 123 444

2. 47 121

3. 146 787

4. 259 2332

5. How many steps to make 87 a vice-versa number? 4

6. Try other numbers.



Silly 99 - BRAINTICKLER

Reverse and subtract, then reverse and add!
99 will appear to make you glad!

Try these. 99 appears in all ten questions.

1. 81

2. 52

3. 92

4. 64

5. 86

6. 61

7. 82

8. 53

9. 41

10. 74

53
- 35
18
+ 81
99

46 Activity: computational practice

Using the Book *Vice-Versa Numbers* Exercises 1, 2, and 3 require one reversal to produce a "vice-versa number", while Exercise 4 requires two. The number 87 in Exercise 5 requires four reversals.

Some numbers require a great many reversals before a "vice-versa number" results. If you wish to make Exercise 6 more structured, provide these numbers for your students. (The circled digit after each number indicates how many reversals are necessary to make a "vice-versa number".)

37 (2), 49 (2), 59 (3), 79 (6), 136 (1), 205 (1), 198 (5), 275 (5), 395 (7), 789 (4), 895 (3)

Silly 99 When students have completed Exercises 1-10, encourage them to choose their own beginning numbers. Provide them with these rules.

1. There must be a difference of 2 or more between the first and second digits, e.g., 64 (difference of 2), 93 (difference of 6). (A number like 43 will not work because there is a difference of only 1.)

2. Numbers where the second digit is greater than the first can be used (e.g., 25). In this case, the original number must be subtracted from the reversed number.

Example

25 52
- 52 - 25
? ?

Some students may wish to explore this number trick using 3-digit numbers. Ask them to predict the results.

Example

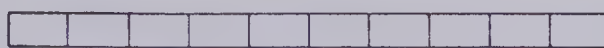
742 854 604
- 247 - 458 - 406
495 396 198
+ 594 + 693 + 891
1089 1089 1089

(The rules above now apply to the first and third digits.)

Centimetre and Decimetre



1 cm



1 dm

Estimate each length to the nearest centimetre. Check.

1. 15 cm
2. 6 cm
3. 2 cm
4. 11 cm
5. 16 cm
6. 12 cm
7. 7 cm

Estimate the length of each to the nearest decimetre. Check.

8. length of your shoe
9. your arm
10. your height
11. your handspan

Centimetres and decimetres 47

Using the Book Instruct the students to estimate the length of the pencil, write it down, then measure to check the estimation. Then estimate the next item, write it down, and measure to check, etc. Their estimations should get better as they proceed in this manner.

ACTIVITIES

1. Ask students to draw, colour, and name a metric monster on a sheet of paper. These are exchanged. The students are to estimate the length of each monster, then check by measuring. They can record their estimates in a chart.

Name	Estimate	Actual	How Close?
Horriblus	23 cm	26 cm	3 cm too short

2. Have students prepare a "Self-Spec" table such as:

Head	_____ cm
Waist	_____ cm
Arm span	_____ cm
Height	_____ cm
Foot	_____ cm
Neck	_____ cm
Handspan	_____ cm

3. Provide the students with an estimate and check chart to be completed. First estimate, then measure each in turn.

Item	Estimate	Measure- ment (to nearest centimetre or decimetre)	How Close?
Longest finger			
Width of 5¢ coin			
New pencil			
New chalk			

(Note: Charts like those above (Activities 2 and 3) can be found in DM47. Though DM47 has been placed for use with page 177 (estimation), it could be used here.)

OBJECTIVE

To estimate and check lengths to the nearest centimetre and decimetre

PACING

Level A All
Level B All
Level C All

VOCABULARY

centimetre (cm), decimetre (dm), handspan

MATERIALS

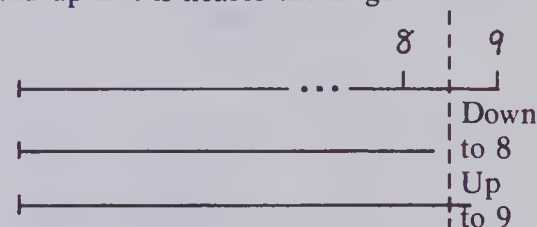
rulers marked in centimetres and decimetres

RELATED AIDS

CALC. W/BK—4.

BACKGROUND

"To the nearest centimetre" means if the measurement is between two whole centimetres, then it is either rounded down to the smaller of the two or up to the larger. It is rounded down if it is nearer the smaller (less than $\frac{1}{2}$ the unit) and up if it is nearer the larger.



SUGGESTIONS

Initial Activity Review the centimetre. Discuss how big 1 cm is and select referents for 1 cm, 10 cm, and any others the students find convenient, i.e., width of thumbnail, handspan, length of longest finger, arm span, etc. Review decimetres as being 10 cm. Identify some common items 1 dm long. Review reading a ruler marked in centimetres and decimetres.

OBJECTIVE

To develop and use the relationship between the metre and the decimetre

PACING

- Level A All
- Level B All
- Level C All

MATERIALS

metrestick or tape marked in decimetres, 1 m of cord for each group

BACKGROUND

The decimal relationship of the metric system is emphasized and developed further:
10 cm = 1 dm
10 dm = 1 m
The prefix "deci-" means one tenth; "centi-" means one hundredth.

ACTIVITIES

1. Start a set of Metric Equivalent Cards. (This set can be added to for page 52.) The students may play "Solitaire", "Snap", or "Concentration". (For general rules of "Concentration", see the Activity Reservoir.)

10 cm

1 dm

20 cm

2 dm

30 cm

3 dm

40 cm

4 dm

100 cm

1 m

200 cm

2 m

300 cm

3 m

400 cm

4 m

10 dm

1 m

20 dm

2 m

30 dm

3 m

40 dm

4 m

2. Prepare a challenge such as:

1 m is worth \$1.00.
1 dm is worth \$0.10.
Then find the value of each length or distance (round to the nearest decimetre).
your height
your best friend's height
height of a door
5 other lengths or distances

Decimetre and Metre

A decimetre is ten centimetres.

1 2 3 4 5 6 7 8 9 10

1 dm = 10 cm

1 m = 10 dm

1. Make a cord 10 dm long
Is it the same length as the cord on this page? yes
The cord is **one metre** long.

2. Estimate the length of each to the nearest decimetre. Check.
(a) tip of middle finger to elbow (b) heel to knee
(c) width of one window

3. Find and measure things about:
(a) 1 dm (b) 2 dm (c) 5 dm (d) 7 dm (e) 10 dm

4. Is one metre as long as your arm? as long as two arms?

5. How many decimetres in a metre? 10 dm
A metre is how many times longer than a decimetre? 10
Use the 1 m cord. Find 5 things that have a measure of about 1 m.

6. Estimate the length of each to the nearest metre. Check.
(a) width of your classroom (b) width of a door
(c) height of ceiling

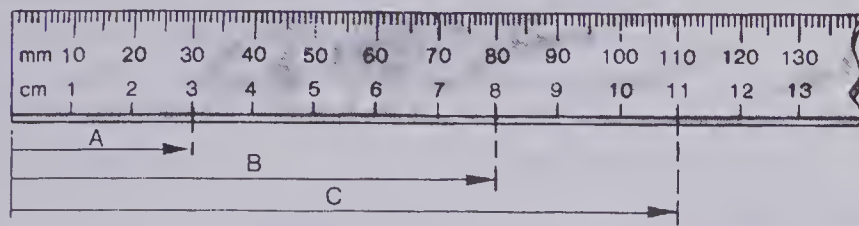
48 Decimetres and metres

Using the Book Provide each group of students with cords and rulers marked in decimetres so that Exercise 1 can be completed. Have the students mark the cord at each decimetre as shown on the page. This cord can then be used for the balance of the exercises.
Students should be encouraged to record their estimates and measurements in a neat and systematic way. One way to do this is by using a chart.

48

Millimetres

One centimetre is equal to ten millimetres. (1 cm = 10 mm)



Arrow A is 30 mm long.
30 mm is 3 cm.

Exercises

A is 30 mm or 3 cm long B is 80 mm or 8 cm long.
C is 110 mm or 11 cm long.

- Write the lengths of the arrows two ways.
- Is a length of 85 mm longer or shorter than 9 cm? shorter
Is a length of 121 mm longer or shorter than 12 cm? longer
3. Name 5 things about 1 mm wide.
4. Name 5 things about 10 mm wide.
5. Measure the length of this page in millimetres; in centimetres.
6. Measure each segment in millimetres.
Then measure in centimetres.

(a) 50 mm, 5 cm

(b) 70 mm, 7 cm

(c) 20 mm, 2 cm

(d) 8 mm, 8 cm

(e) 110 mm, 11 cm

Millimetres 49

Using the Book Do Exercises 1 and 2 orally with groups, ensuring that the students can read the ruler correctly, both in millimetres and in centimetres. Exercise 2 will indicate whether students are comprehending that millimetres are much smaller than centimetres and that a small number of centimetres can indicate a longer length than a larger number of millimetres.

Have students work in pairs to check each other's lists in Exercises 3 and 4.

Exercises 5 and 6 may be checked in class or as indicated for Exercises 3 and 4.

ACTIVITIES

1. Ask the students to (a) find the meanings of each prefix: "deci-", "centi-", "milli-"; and (b) use these meanings to tell what each means: "decimetre", "centimetre", "millimetre".

2. Prepare this puzzle in millimetres. Draw a set of lines the lengths in millimetres shown. The students are to measure the lines and using the code solve the puzzle: WHERE DOES THURSDAY COME BEFORE WEDNESDAY? (Answer is given.)

5	30	20	15	25
i	n	t	h	e

10	5	35	20	5	40	30	45	50	55
d	i	c	t	i	o	n	a	r	y

Code:

5 mm 10 mm 15 mm 20 mm 25 mm 30 mm

i d h t l e n

35 mm 40 mm 45 mm 50 mm 55 mm

c o a r y

3. With the students prepare a display on photography. Use samples of film size such as 8 mm, 16 mm, 35 mm and various sizes of developed pictures. These will serve as visual referents for students.

OBJECTIVES

To measure using the millimetre
To develop and use the relationship between the millimetre and centimetre

PACING

Level A All
Level B All
Level C All

VOCABULARY

millimetre

MATERIALS

rulers graduated in millimetres and centimetres

RELATED AIDS

HMS—DM14.

BACKGROUND

The prefix "milli-" means one thousandth.

"Millimetre" means one thousandth of a metre.

1000 mm = 1 m

10 mm = 1 cm

Activities are suggested in which students measure real objects. As a step to the more abstract, students are asked to measure segments (Exercise 6).

SUGGESTIONS

Initial Activity Introduce the rulers marked in millimetres and show the class how to measure lengths in millimetres. Choose some objects that are 10, 20, 30, 40 cm long in order to develop the relationship between millimetres and centimetres.

EXTRA PRACTICE

HMS—DM14.

OBJECTIVE

To develop and use the power of 10 relationship among millimetres, centimetres, decimetres, and metres

PACING

Level A Optional
Level B Optional
Level C All

MATERIALS

metre cord from page 48; metresticks; rulers marked in millimetres, decimetres, and centimetres

RELATED AIDS

HMS—DM14 and DM15.

SUGGESTIONS

Initial Activity If the students have not done Activity 1, page 49, have them do it now or do it as a class activity.

ACTIVITIES

1. Pose questions like these. Limit the difficulty according to your students. Which is longer?

- a centimetre or decimetre
- a centimetre or millimetre
- a centimetre or metre
- a millimetre or decimetre
- a decimetre or metre
- a millimetre or metre
- a decimetre or ten centimetres
- one hundred centimetres or ten metres

2. Have the students make and complete this chart. They may use their rulers and metresticks.

In words	In symbols
One metre is the same length as ____ decimetres, as ____ centimetres, as ____ millimetres.	$1\text{ m} = \underline{\hspace{1cm}}\text{ dm}$ $1\text{ m} = \underline{\hspace{1cm}}\text{ cm}$ $1\text{ m} = \underline{\hspace{1cm}}\text{ mm}$
Ten decimetres is the same length as ____ metres.	$10\text{ dm} = \underline{\hspace{1cm}}\text{ m}$
One hundred centimetres is the same length as ____ metres.	$100\text{ cm} = \underline{\hspace{1cm}}\text{ m}$
One thousand centimetres is the same length as ____ metres.	$1000\text{ cm} = \underline{\hspace{1cm}}\text{ m}$

3. How many times longer is:
- a decimetre than a centimetre?
 - a centimetre than a millimetre?

Millimetres, Centimetres, Decimetres

A metre contains ...

... ten decimetres 10 dm
... one hundred centimetres 100 cm
... one thousand millimetres 1000 mm

Exercises

- Use your metre cord.
How many times will it go around your waist?
- Is your cord marked in decimetres? If not, mark it.
How many decimetres in one metre?

$$10 \blacksquare \text{ dm} = 1 \text{ m}$$

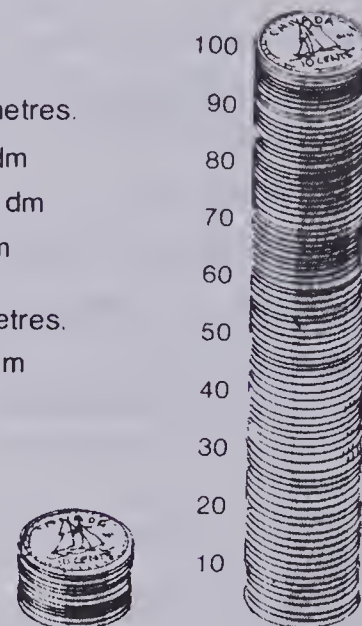
- Mark one decimetre of your cord with centimetres.

$$\begin{array}{ll} 10 \blacksquare \text{ cm} = 1 \text{ dm} & 50 \blacksquare \text{ cm} = 5 \text{ dm} \\ 20 \blacksquare \text{ cm} = 2 \text{ dm} & 100 \blacksquare \text{ cm} = 10 \text{ dm} \\ 30 \blacksquare \text{ cm} = 3 \text{ dm} & 100 \blacksquare \text{ cm} = 1 \text{ m} \end{array}$$

- Mark one centimetre of your cord with millimetres.

$$10 \blacksquare \text{ mm} = 1 \text{ cm} \quad 1000 \blacksquare \text{ mm} = 1 \text{ m}$$

- A dime is about 1 mm thick.
How tall is a stack of 10 dimes? 10 mm
How tall is a stack of 100 dimes? 100 mm
How tall is a stack of 1000 dimes? 1000 mm



- Write the words for dm, cm, mm, and m. decimetre, centimetre, millimetre, metre

50 Relating units of length

Using the Book Put the class into groups to work this page. Assist each group in defining in their own words the relationships illustrated by the various questions. The actual experiences of making these measurements will help the students conceptualize.

Use first 10 dimes then 20 dimes for Exercise 5. Ask students to continue:

$$\begin{array}{l} 10 \text{ dimes} = 1 \text{ cm} \\ 20 \text{ dimes} = 2 \text{ cm} \end{array}$$

•
•
•

$$100 \text{ dimes} = 10 \text{ cm}$$

- a metre than a decimetre?
- a metre than a centimetre?
- a metre than a millimetre?

EXTRA PRACTICE

If you have not already done so, see DM14 and DM15.

Kilometre

Long distances are measured in kilometres.

Some distances that may be measured in kilometres are:

From your home to school

Across town

To your holiday resort

Across Canada

Between cities of Canada

Between cities of the world

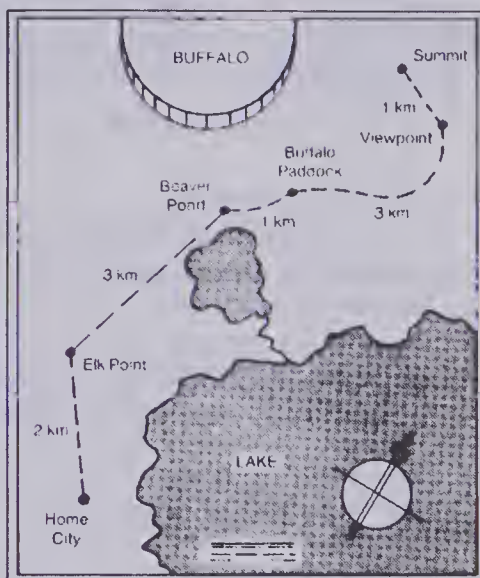
Mike and Trudy cut a cord 100 m long.

10 of these are the same length as a **kilometre** (km).

Exercises

This map shows distances in kilometres.

1. A Guide Pack started on a hike from Home City.
They hiked to Beaver Pond by noon.
How far did they hike by noon? 5 km
2. Then they hiked to Viewpoint.
How far were they from Home City? 9 km
3. How far is it from Beaver Pond to Viewpoint? 4 km
4. Then they hiked from Viewpoint to Summit.
How far is it from Viewpoint to Summit? 1 km
5. Name in order all the places the girls passed in going from Home City to Summit.
Home City, Elk Point, Beaver Pond, Buffalo Paddock, Viewpoint, Summit

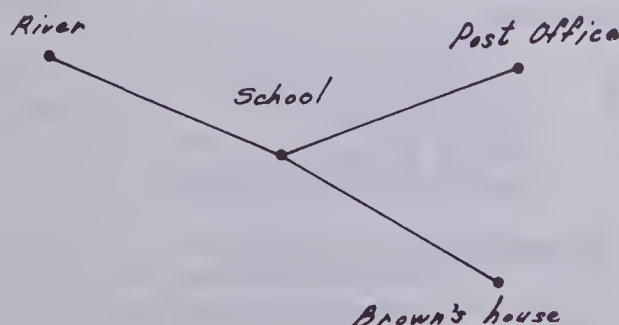


Kilometres 51

Using the Book Discuss the display and the map. You may wish to do the exercises orally in order to allow for time to do the Initial Activities which are the most important.

ACTIVITIES

1. Work as a group to identify and list landmarks about 1 km from the school. Prepare a display for the bulletin board using coloured yarn.



2. Students may prepare a chart of how far each lives from the school. These only need to be estimates such as less than 1 km, more than 1 km, less than 2 km, etc.

3. Let the students use a trundle wheel to calculate long distances such as the distance around the school-grounds, around a city block, etc.

4. Set up a 1 km running track. Each student records the number of times he/she runs the 1 km distance. How many days will it take the class to run a distance equivalent to the distance from your city to Ottawa (or choose some other destination)?

OBJECTIVES

To develop and use the concept of a kilometre

To use distances between points on a map

PACING

Level A All

Level B All

Level C All

VOCABULARY

kilometre, resort

MATERIALS

100 m cord

BACKGROUND

1 km = 1000 m

100 m is a hectometre (100 m = 1 hm)

10 × 10 m = 1000 m
= 1 km

SUGGESTIONS

Initial Activity Before using this page, set up a "neighbourhood walk". It could be designed in conjunction with some other class outing, physical education, or mapping activity. For the purposes of using this page, it would be valuable if the children had some prior experience with the kilometre as an actual unit of length rather than as a rendering on a map. Be certain to time the outing and keep to a normal pace. It is important for each child to have a personal referent for a kilometre, i.e., it is 1 km from school to ____; 1 km is the distance it takes me ____ min to walk.

Provide, if possible, a 100 m cord (or use a trundle wheel to measure off this distance in the schoolyard). Using this distance, time the children as they perform various tasks (walking, jogging, running, bicycle riding, etc.). Take the results back to the classroom and calculate (i.e., multiply by 10) at these rates, how long it would have taken to complete 1 km.

EXTRA PRACTICE

Copy and complete.

1 m = ____ dm	1 dm = ____ mm
2 m = ____ dm	2 dm = ____ mm
3 m = ____ dm	3 dm = ____ mm
10 m = ____ dm	10 dm = ____ mm

1 km = ____ m
2 km = ____ m
3 km = ____ m
10 km = ____ m

OBJECTIVE

To identify the number of smaller units in multiples of larger units

PACING

Level A Optional
Level B Optional
Level C All

RELATED AIDS

HMS—DM14.

BACKGROUND

This page utilizes the concepts and skills developed in the preceding pages. Whether or not a student should do this page may be determined by the degree of success and the need for practice in the preceding pages. Level A students may not be ready for this.

ACTIVITIES

1. Prepare a set of Metric Matching Cards. Suggestions are provided here.

Item	Approximate Measure
tall man	2 m
width of a car	12 dm
width of finger-nail	1 cm
you can run	1 km
height of teacher's desk	75 cm
door width	1 m

Item	Approximate Measure
length of a shoe	25 cm
length of table fork	200 mm
length of new pencil	20 cm
width of page of exercise book	220 mm
chalkboard eraser length	14 cm
student ruler length	3 dm

Students may play "Solitaire" or play a game of "Snap".

2. Extend the Metric Equivalent Card set started on page 48.

1000 m	1 km	1000 mm	1 m
2000 m	2 km	2000 mm	2 m
3000 m	3 km	3000 mm	3 m

Lengths

$10 \text{ mm} = 1 \text{ cm}$

$10 \text{ cm} = 1 \text{ dm}$

$10 \text{ dm} = 1 \text{ m}$

$100 \text{ cm} = 1 \text{ m}$



Exercises

● Draw a line 1 m long.

(a) How many centimetres in 1 m?

$1 \text{ m} = \blacksquare \text{ cm }^{100}$

(b) How many decimetres in 1 m?

$1 \text{ m} = \blacksquare \text{ dm }^{10}$

● Draw a line 2 m long.

(a) How many centimetres in 2 m?

$2 \text{ m} = \blacksquare \text{ cm }^{200}$

(b) How many decimetres in 2 m?

$2 \text{ m} = \blacksquare \text{ dm }^{20}$

3. Draw a line 3 m long.

(a) How many centimetres in 3 m?

$3 \text{ m} = \blacksquare \text{ cm }^{300}$

(b) How many decimetres in 3 m?

$3 \text{ m} = \blacksquare \text{ dm }^{30}$

4. Draw a line 2 dm long.

(a) How many centimetres in 2 dm?

$2 \text{ dm} = \blacksquare \text{ cm }^{20}$

(b) How many millimetres in 2 dm?

$2 \text{ dm} = \blacksquare \text{ mm }^{200}$

5. Draw a line 3 cm long.

How many millimetres in 3 cm?

$3 \text{ cm} = \blacksquare \text{ mm }^{30}$

6. $1 \text{ cm} = \blacksquare \text{ mm }^{10}$

$1 \text{ dm} = \blacksquare \text{ cm }^{10}$

$1 \text{ m} = \blacksquare \text{ cm }^{100}$

$10 \text{ cm} = \blacksquare \text{ mm }^{100}$

$10 \text{ dm} = \blacksquare \text{ cm }^{100}$

$10 \text{ m} = \blacksquare \text{ cm }^{1000}$

$20 \text{ cm} = \blacksquare \text{ mm }^{200}$

$20 \text{ dm} = \blacksquare \text{ cm }^{200}$

$20 \text{ m} = \blacksquare \text{ cm }^{2000}$

52 Units with relationships review

Using the Book Have the students work in pairs (or small groups). One student draws the line described and the other students measure it in the units required. This can be repeated for each of Exercises 1 through 5.

The teacher, moving from one group to another, may do Exercise 6 orally.

4000 m

4 km

4000 mm

4 m

10 mm

1 cm

20 mm

2 cm

30 mm

3 cm

40 mm

4 cm

Suppose:

1 m is worth \$1.00,

1 cm is worth \$0.01,

then 25 cm is worth \$0.25.

Then find the value of each length or distance:

your height

your best friend's height

height of a desk

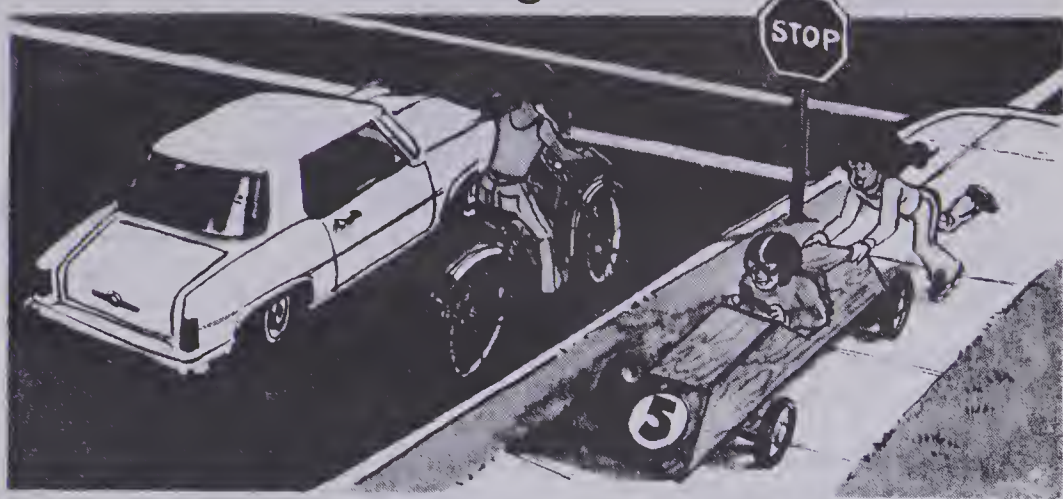
distance to the library

5 other lengths or distances

EXTRA PRACTICE

If you have not already done so, see DM14.

Getting Around



Write a number sentence to solve each problem.

- | | |
|---|--|
| 1. Mary's bicycle is 96 cm tall.
Jill's bicycle is 87 cm tall. $96 - 87 = 9$
How much taller is Mary's bicycle? 9 cm | 2. Mary rode her bicycle 11 km.
Jill rode her bicycle 18 km. $11 + 18 = 29$
How far did they ride altogether? 29 km |
| 3. Kim's wheels are 28 mm wide.
Max's wheels are 42 mm wide. $42 - 28 = 14$
How much wider are Max's wheels? 14 mm | 4. Jose's race car is 135 cm long.
Nina's race car is 150 cm long.
How long are the two cars together?
$135 + 150 = 285$ 285 cm |
| 5. Jose wants red trim on his car.
Jose needs 11 m of red trim.
He has 7 m of red trim. $11 - 7 = 4$
How much more does he need? 4 m | 6. Mary lives 22 km from Appleville.
She lives 31 km from Orangeville.
How much closer is Appleville? 9 km
$31 - 22 = 9$ |

Writing number sentences to solve measurement problems

OBJECTIVE

To write number sentences to solve problems involving measurement

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activity Present a problem such as:

Joan's bat is 85 cm long.

Mary's bat is 75 cm long.

How much longer is Joan's bat?

Take the students through these steps, illustrating each on the chalkboard.

1. Draw a diagram.
2. Professor Q's four questions.
3. Write a number sentence.
4. Solve.
5. Write a word sentence answering the question.

Using the Book Select several students (volunteers ?) to do Exercise 1 at the chalkboard while the others do it at their desks. Discuss the chalkboard solutions, highlighting those areas of difficulty.

ACTIVITIES

1. Provide each student with an index card. Each is to write a word problem involving measurements. On the back of the card the student is to write a full solution (with diagram?). These cards can be filed in a Problem Box and students work the problems as they get time.

You may need to provide sample cards and/or specific problem guidelines such as: "Write a word problem using these facts: 160 cm, 100 cm, etc."

2. Challenge the class with this problem:
Three men want to cross a river. The only boat available can carry only 150 kg. The masses of the men are 50 kg, 75 kg and 110 kg. How can the

three men get safely across the river using the boat? Encourage the children to make and use models in solving the problem. (Solution: The two lightest go across. One goes back. The heaviest goes across. The lighter goes back. The two lightest go across.)

EXTRA PRACTICE

Prepare a set of Problem and Number Sentence Matching Cards.

1. Bill had 53 comic books. Pete gave him 27 more. How many does he have now?
 $53 + 27 = \square$
2. Mary had a ten-dollar bill. She spent \$3.80. How much did she have left?
 $10.00 - \$3.80 = \square$

3. Six times a number is 48. What is the number?
 $6 \times \square = 48$
4. Barb plans to run 53 km in training for a race meet. She has run 27 km to date. How much farther does she have to run?
 $53 - 27 = \square$
5. Phil had \$3.80. He earned ten dollars by mowing lawns. How much does he have now?
 $\$3.80 + 10.00 = \square$
6. What is the product of 6 and 48?
 $6 \times 48 = \square$
7. Krista's mother ordered 28 m of ribbon at \$2/m. How much did the ribbon cost?
 $28 \times \$2 = \square$
8. Hilda had 28 cm of ribbon which she cut into two equal pieces. How long is each piece?
 $28 \div 2 = \square$

Have the children (a) match the cards, (b) complete the number sentences, and (c) solve the problem.

OBJECTIVES

To solve problems using measurements
To choose the most appropriate unit of measurement

PACING

Level A 1-3, 6-8

Level B All

Level C All

VOCABULARY

manufacturing plant, assembly line

SUGGESTIONS

Initial Activity Discuss the type of work done on assembly lines. Areas discussed may include:

- why some work is done on assembly lines
- why some people would and some would not enjoy working there
- types of manufactured items that come off assembly lines.

ACTIVITIES

1. Have the students continue to exchange problem cards from the Problem Box prepared as described in Activity 1 on page 53.

2. Use the Metric Equivalent Card set described on pages 48 and 52 to play Concentration, the rules for which are in the Activity Reservoir.

3. See Extra Practice, page 53. Give the students the problem cards only. The task is to write an appropriate number sentence and to solve the problem.

EXTRA PRACTICE

1. Ms. Evans bought 186 m of garden fence.
Mr. Brown bought 298 m of garden fence.
Ms. George bought 359 m of garden fence.
How much garden fence did the three buy altogether? (843 m)
2. The Hill family decided to drive to a lake 540 km away for a camping trip.
They drove 185 km the first day.
How much farther do they have to drive? (355 km)
3. Mr. Brown is 28 a old and is 176 cm tall.
Mr. Green is 32 a old and is 169 cm tall.
How much taller is Mr. Brown? (7 cm)
4. When the Walker family went on a holiday, they drove 254 km on Monday, 137 km on Tuesday, and 97 km on Wednesday.



Manufacturing Plant

Mark and Sue work on an assembly line in a manufacturing plant.

Exercises

● A worker must know the metric system.

10 ■ mm = 1 cm

100 ■ cm = 1 m

10 ■ cm = 1 dm

1000 ■ m = 1 km

2. Mark puts trim on a car.
One strip is 45 cm long.
Another strip is 15 cm long.
Another is 40 cm long.
How long are the 3 altogether? 100 cm
3. Sue puts windows in doors.
The first is 875 mm long.
The second is 698 mm long.
How much longer is the first window? 177 mm
4. Sue bolts in the battery.
One bolt is 12 cm long.
Another bolt is 128 mm long.
Which is the longer bolt? The 128 mm bolt is longer.
5. Mark puts bolts in doors.
One bolt is 28 cm long.
Another bolt is 289 mm long.
Which bolt is longer? The 289 mm bolt is longer.

Choose the best unit.

- | | | |
|-------------------|----------------------------|--------------------|
| 6. Width of a car | 7. Length of a door handle | 8. Width of a tire |
| (a) 2 mm (d) | (a) 10 mm (b) | (a) 14 mm (b) |
| (b) 2 cm | (b) 10 cm | (b) 14 cm |
| (c) 2 dm | (c) 10 dm | (c) 14 dm |
| (d) 2 m | (d) 10 m | (d) 14 m |

54 Using metric units, most appropriate units

Using the Book You may wish to do Exercises 1, 6, 7, and 8 orally. For Exercises 6, 7, and 8 you may have students illustrate the widths and lengths using their hands, arms, etc.

Assign Exercises 2-5 to be done in exercise books.

How far did they drive on those three days? (488 km)

5. There are 366 d (days) in 1980 and 365 d in each of 1981 and 1982. How many days altogether in 1980, 1981, and 1982? (1096 d)

Tune Up



Add.

1. $\begin{array}{r} 1 \\ 3 \\ +4 \\ \hline 8 \end{array}$	2. $\begin{array}{r} 3 \\ 9 \\ +8 \\ \hline 20 \end{array}$	3. $\begin{array}{r} 8 \\ 1 \\ +9 \\ \hline 18 \end{array}$	4. $\begin{array}{r} 7 \\ 2 \\ 6 \\ +8 \\ \hline 23 \end{array}$	5. $\begin{array}{r} 8 \\ 4 \\ 6 \\ +2 \\ \hline 20 \end{array}$	6. $\begin{array}{r} 9 \\ 8 \\ 1 \\ +2 \\ \hline 20 \end{array}$
--	---	---	--	--	--

7. $\begin{array}{r} 26 \\ +13 \\ \hline 39 \end{array}$	8. $\begin{array}{r} 36 \\ +28 \\ \hline 64 \end{array}$	9. $\begin{array}{r} 108 \\ +21 \\ \hline 129 \end{array}$	10. $\begin{array}{r} 661 \\ +239 \\ \hline 900 \end{array}$	11. $\begin{array}{r} 206 \\ +407 \\ \hline 613 \end{array}$
--	--	--	--	--

12. $\begin{array}{r} 5310 \\ +2263 \\ \hline 7573 \end{array}$	13. $\begin{array}{r} 1769 \\ +2053 \\ \hline 3822 \end{array}$	14. $\begin{array}{r} 23470 \\ +16599 \\ \hline 40069 \end{array}$	15. $\begin{array}{r} 30306 \\ +33060 \\ \hline 63366 \end{array}$
---	---	--	--

Subtract.

16. $\begin{array}{r} 87 \\ -66 \\ \hline 21 \end{array}$	17. $\begin{array}{r} 60 \\ -32 \\ \hline 28 \end{array}$	18. $\begin{array}{r} 878 \\ -869 \\ \hline 9 \end{array}$
---	---	--

19. $\begin{array}{r} 900 \\ -92 \\ \hline 808 \end{array}$	20. $\begin{array}{r} 806 \\ -28 \\ \hline 778 \end{array}$	21. $\begin{array}{r} 3458 \\ -1236 \\ \hline 2222 \end{array}$
---	---	---

22. $\begin{array}{r} 3000 \\ -1982 \\ \hline 1018 \end{array}$	23. $\begin{array}{r} 6060 \\ -771 \\ \hline 5289 \end{array}$	24. $\begin{array}{r} 20504 \\ -10608 \\ \hline 9896 \end{array}$
---	--	---

Tune Up Score Card	
Points	Mechanic's Report
24-22	Excellent tune up!
21-19	Very good tune up!
18-17	Good tune up!
16-15	Fair tune up!
14-less	Time out for repairs

1 mark for each correct answer.
How was your tune up?

OBJECTIVE

To review addition and subtraction

PACING

Level A All
Level B All
Level C Optional

Green Card

$\begin{array}{r} 183 \\ -61 \\ \hline \end{array}$	$\begin{array}{r} 59 \\ -23 \\ \hline \end{array}$	$\begin{array}{r} 237 \\ -113 \\ \hline \end{array}$	$\begin{array}{r} 867 \\ -251 \\ \hline \end{array}$
---	--	--	--

$\begin{array}{r} 4564 \\ -1031 \\ \hline \end{array}$	$\begin{array}{r} 5760 \\ -2120 \\ \hline \end{array}$	$\begin{array}{r} 6739 \\ -1418 \\ \hline \end{array}$	$\begin{array}{r} 67898 \\ -13251 \\ \hline \end{array}$
--	--	--	--

$\begin{array}{r} 85403 \\ -21403 \\ \hline \end{array}$	$\begin{array}{r} 80000 \\ -80000 \\ \hline \end{array}$
--	--

Yellow Card

$\begin{array}{r} 92 \\ -67 \\ \hline \end{array}$	$\begin{array}{r} 83 \\ -27 \\ \hline \end{array}$	$\begin{array}{r} 123 \\ -83 \\ \hline \end{array}$	$\begin{array}{r} 426 \\ -153 \\ \hline \end{array}$
--	--	---	--

$\begin{array}{r} 3204 \\ -2118 \\ \hline \end{array}$	$\begin{array}{r} 3410 \\ -1777 \\ \hline \end{array}$	$\begin{array}{r} 2500 \\ -1173 \\ \hline \end{array}$	$\begin{array}{r} 2006 \\ -1119 \\ \hline \end{array}$
--	--	--	--

$\begin{array}{r} 3002 \\ -1993 \\ \hline \end{array}$	$\begin{array}{r} 50004 \\ -12039 \\ \hline \end{array}$
--	--

Using the Book Assign the first and last of each row. If difficulties exist, discuss them and assign the balance of the row in which difficulty exists.

If further review is necessary, select further questions for review from the appropriate pages:

Exercises	Pages
1-6	14-15
7-11	17
12-15	38-39
16-18	28
19-21	29
22-24	42-43

For alternate scoring procedures, see Using the Book, page 44.

ACTIVITIES

1. Prepare a set of Coloured Quiz Cards. Samples are shown. Put no more than 10 questions on each card. Each card should involve only one type of computation. Answers can be placed on the reverse side.

Blue Card

9	7	3	5	5	8	6	7
7	6	2	7	6	5	3	1
6	2	9	2	4	2	2	1
+3	+1	+4	+8	+3	+1	1	3
						4	2
						+5	+1

Red Card

$\begin{array}{r} 52134 \\ +27204 \\ \hline \end{array}$	$\begin{array}{r} 10031 \\ +49980 \\ \hline \end{array}$	$\begin{array}{r} 63456 \\ +31009 \\ \hline \end{array}$
--	--	--

$\begin{array}{r} 67093 \\ +21001 \\ \hline \end{array}$	$\begin{array}{r} 37004 \\ +27611 \\ \hline \end{array}$	$\begin{array}{r} 41000 \\ +27003 \\ \hline \end{array}$
--	--	--

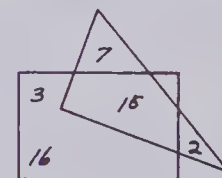
$\begin{array}{r} 19999 \\ +29999 \\ \hline \end{array}$	$\begin{array}{r} 147632 \\ +239046 \\ \hline \end{array}$	$\begin{array}{r} 27411 \\ +51999 \\ \hline \end{array}$
--	--	--

$\begin{array}{r} 742356 \\ +145990 \\ \hline \end{array}$
--



Rob

Ring in blue each number in the rectangle.
Ring in brown each number in the triangle.
My number is ringed twice.

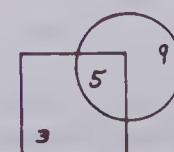


Rob's number



Jill

Ring in red each number in the square.
Ring in green each number in the circle.
My number is ringed twice.



Jill's number

OBJECTIVE

To translate Roman numerals to base-ten numeration and vice versa

PACING

Level A All
Level B All
Level C All

VOCABULARY

Roman numerals

SUGGESTIONS

Initial Activity To introduce this lesson, you might place a Roman numeral on the chalkboard (MCMXLVII) and say, "I found symbols like these written on the corner of the old bank building downtown. What are they? What do they mean?"

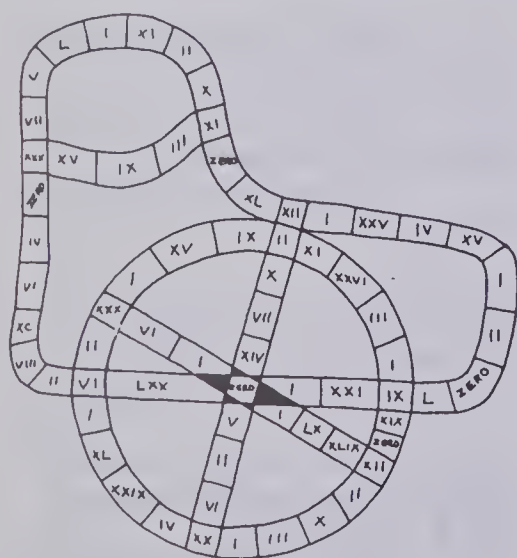
Discuss with the children where these numerals are still used — corner-stones, old clocks, volume headings, introductory pages to a book, etc.

Use the display, or a similar chalkboard chart to identify the values of the various symbols, and demonstrate how symbols are combined using addition and subtraction to form other values.

ACTIVITIES

1. Play "Roaming Roman". Prepare a simple gameboard as shown and 2 dice labelled with various Roman numerals to XX.

ROAMING ROMAN



Players take turns rolling both dice and moving counters in any direction the number of spaces indicated by adding both dice. (Players may not back up!) Players record the number of each square they land on, keeping a cumulative total. Winner is the player with the highest total after each player has had

Roman Numerals

The Romans used different numerals from ours.

Roman	I	V	X	L	C
Ours	1	5	10	50	100



How many swords?

Roman	x	I	I
Ours	10 + 1 + 1		

XII swords

How many horses?

Roman	C	L	X	V
Ours	100 + 50 + 10 + 5			

CLXV horses

Exercises

1. Rewrite using our numerals.

- (a) XV 15 (b) VIII 8 (c) II 2 (d) CL 150 (e) XVI 16
(f) XXX 30 (g) VI 6 (h) LXXI 71 (i) CLXVIII 168 (j) CII 102

For special numerals, the Romans used subtraction.

$$IV = 5 - 1 \text{ (or 4)}$$

$$XL = 50 - 10 \text{ (or 40)}$$

C	XL	IX
100	+ 40	+ 9
= 149		

2. Rewrite using our numerals.

- (a) IX 9 (b) XC 90 (c) LIX 59 (d) XXXIX 39 (e) XCIX 99
(f) CXLII 142 (g) LXXIV 74 (h) XLIV 44 (i) XLIII 43 (j) CCXXIV 224

56 Roman numerals

Using the Book Exercises 1 and 2 could be done together as a whole class. Some students may wonder about the subtraction example. "Can 149 be written as CIL?" Suggest that they use the expanded form of our numeral to help select the appropriate Roman numerals. For example, "Could we write 999 as CCIC?"

If we expand, we can apply the correct symbols: $299 = 200 + 90 + 9$

$\downarrow \quad \downarrow \quad \downarrow$
 CC XC IX

Therefore, 299 is written as CCXCIX.

If the students are unfamiliar with decoding, spend a few moments to ensure that they understand the instructions for Exercise 5 on page 57.

3. Rewrite using Roman numerals.

● 37 XXXVII ● 49 XLIX ● 129 CXXIX (d) 355 CCCLV(e) 148 CXLVIII
(f) 204 CCIV (g) 85 LXXXV(h) 164 CLXIV(i) 111 CXI (j) 394 CCCXCIV

4. The Emperor had a secret storeroom.

Use our numerals to tell how many of each thing he had!

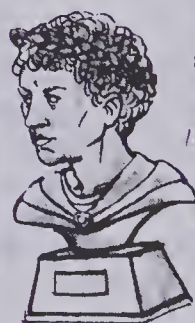
XXIV jars of oil 24 XXXV spears 35 XL pairs of sandals 40 LXI robes 61
XLVIII jars of grain 48 XXIX swords 29 IX chests of coins 9 XVIII bridles 18

5. Find the answer to the question by writing our numerals for the Roman ones.

Then use the code. (The first numeral is done for you.)

Why was the Emperor so hard to find?

Ours	Roman	Code
49	XLIX	E
25	LXIII	A
25	XXV	R
9	IX	O
57	LVII	N
105	CV	T
72	LXXII	H



Ours	Roman	Code
18	XVIII	U
83	LXXXIII	L
34	XXXIV	M
126	CXXVI	C
51	LI	D
18	LXXVIII	P

The Emperor was always

A R O U N D						T H E		
63	25	9	18	57	51	105	72	49
P A L A C E								
78	63	83	63	126	49	!		

10 rolls. In order to win, winner must be able to write total in Roman numerals.

2. Play "Concentration" as described in the Activity Reservoir. Prepare about 10 pairs of cards per deck.

Example

XIX	19
L	50

3. Play "Bingo" as described in the Activity Reservoir. Distribute blank Bingo cards. Have players fill each square in using Roman numerals from 1-30 (or 30-60, etc.). Usual Bingo rules apply.

OBJECTIVE

To evaluate achievement of the chapter objectives


PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS—DM16.

Chapter Test

1. Write a numeral for each.
(a)  1113 (b) CLXIII 163
(c) three thousand, two hundred ninety-four 3294
(d) six thousand, five hundred seven 6507
2. Compare. Use >, =, or < .
(a) 5367 ● 4989 > (b) 680 ● 684 < (c) 5000 ● 5100 <
3. Add.
(a)
$$\begin{array}{r} 3415 \\ + 6749 \\ \hline 10164 \end{array}$$
 (b)
$$\begin{array}{r} 23915 \\ + 38227 \\ \hline 62142 \end{array}$$
4. Subtract.
(a)
$$\begin{array}{r} 8761 \\ - 4120 \\ \hline 4641 \end{array}$$
 (b)
$$\begin{array}{r} 71010 \\ - 52839 \\ \hline 18171 \end{array}$$
5. Which is longer?
(a) 3 cm or 20 mm 3 cm
(b) 2 m or 500 cm 500 cm
6. Use a ruler. Draw lines:
(a) 25 mm long _____
(b) 7 cm long _____
7. Complete.
(a) 10 mm = ■ cm 1 (b) 1 km = ■ m 1000 (c) ■ mm = 1 m 1000
8. Estimate the length in centimetres.
(a) _____ 4 cm (b) _____ 7 cm
9. Three Scouts ran a relay race.
One ran 550 m, another ran 740 m, and the third ran 810 m.
How far did they run altogether? 2100 m
10. Nadine's pencil was 10 cm long.
How many millimetres long was it? 100 mm

58 Chapter 2 test

Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a number of students had difficulty with a particular topic or concept.

The following chart will help in this respect. The specific objectives are listed in the Chapter Overview (see page 32).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1	A	33
2	B	36
3	C	39
4	D	43
5-8	E	47-50
9, 10	F	53

Cumulative Review

1. $83 = \overset{8}{\blacksquare}$ tens and $\overset{3}{\blacksquare}$ ones
2. Complete.
9th, \blacksquare , \blacksquare , \blacksquare .
10th, 11th, 12th
3. Compare. Use $>$, $=$, or $<$.
(a) $65 \bullet 73 <$ (b) $508 \bullet 439 >$ (c) $5387 \bullet 6241 <$
4. Give the meaning of the red digit.
(a) 7831 8 hundreds (b) 4381 4 thousands (c) 1508 0 tens
5. Rewrite using our numerals. (a) viii 8 (b) xii 12 (c) xl 40
6. Add.
(a)
$$\begin{array}{r} 7 \\ 2 \\ 8 \\ + 3 \\ \hline 20 \end{array}$$
 (b)
$$\begin{array}{r} 43\,095 \\ + 26\,487 \\ \hline 69\,582 \end{array}$$
 (c)
$$\begin{array}{r} 6 \\ 8 \\ 4 \\ + 1 \\ \hline 19 \end{array}$$
7. Subtract.
(a)
$$\begin{array}{r} 74\,583 \\ - 61\,320 \\ \hline 13\,263 \end{array}$$
 (b)
$$\begin{array}{r} 4006 \\ - 1238 \\ \hline 2768 \end{array}$$
8. Name an object (a) about 1 m long (b) about 5 cm long.
9. Use a ruler. Draw lines:
(a) 15 mm long (b) 23 cm long (c) 1 dm long.
10. Angelo bought 28 donuts.
There are 6 donuts left.
How many were eaten? 22
11. Agnes had 3 ribbons.
They were 55 cm, 42 cm, and
38 cm long.
How much ribbon altogether? 135 cm

OBJECTIVE

To review and test selected concepts and skills previously covered

PACING

Level A All
Level B All
Level C All

Chapters 1-2: cumulative review 59

Using the Book This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1	2
2	4
3(a), 3(b)	35
3(c)	36
4	33
5	56
6(a), 6(c)	15
6(b)	39
7(a)	43
7(b)	42
8, 9	47-50
10, 11	10-11

CHAPTER 3 OVERVIEW

This chapter develops the concept of, and provides practice with multiplication of, whole numbers. Preliminary skills such as multiplication with basic facts, multiplication by powers of ten, rounding, estimation, and introductory algorithms are applied to the final or standard multiplication algorithm.

OBJECTIVES

- A To develop basic multiplication facts to 10×10
- B To multiply using 1, 10, 100, 1000 as one of the factors
- C To round numbers to the nearest 10 and 100
- D To estimate products
- E To multiply up to a 1-digit factor times a 3-digit factor without and with regrouping
- F To solve problems

BACKGROUND

The pages which illustrate the meaning of multiplication both in this chapter and the next (Chapter 4: Division) present examples such as "4 groups of 6" as being numerically represented as " $4 \times 6 = 24$ ". This is an arbitrary stand taken in the interest of consistency. It is not intended to suggest that student responses representing "4 groups of 6" as " $6 \times 4 = 24$ " should be dismissed as "incorrect". It is suggested, however, that whatever your interpretation, your representations be consistent.

The Order Principle of Multiplication (Commutative Property) is represented as $a \times b = b \times a$. It is not intended that students should memorize the term or its algebraic representation. Rather, it is applied in a practical way to discovery of "new" multiplication facts.

Example

"If I know $2 \times 6 = 12$, then I know $6 \times 2 = 12$."

The Grouping Principle of Multiplication (Associative Property) is represented as $(a \times b) \times c = a \times (b \times c)$.

The principle is used to facilitate multiplication with three or more factors.

Example

$$\begin{aligned}(4 \times 5) \times 6 &= 4 \times (5 \times 6) \\ &= 4 \times 30 \\ &= 120\end{aligned}$$

The Multiplication-Addition Principle (Distributive Property) is represented as $a(b + c) = (a \times b) + (a \times c)$.

This principle is used to develop understanding of the vertical multiplication algorithm.

Example

$$\begin{aligned}6 \times 25 \\ 6 \times 25 &= 6(20 + 5) \\ &= (6 \times 20) + (6 \times 5) \longrightarrow \\ &= 120 + 30 \\ &= 150\end{aligned}$$

$$\begin{array}{r} 25 \\ \times 6 \\ \hline 30(6 \times 5) \longrightarrow \\ 120(6 \times 20) \\ \hline 150 \end{array}$$

MATERIALS

counters
drill devices (dice, spinners, flash cards)

CAREER AWARENESS

Sports Shop Owner [97]

A sports shop owner generally keeps a large variety of items in stock and must have a broad knowledge about the products and the related sports. The owner must be ready to advise customers who are sports professionals and also those people who are amateurs seeking to learn more about a new sport.

Some shops sell items that are not always considered to be related to a sport, but are more recreational in nature — camping supplies (tents, portable stoves, sleeping bags), bicycles, canoes. Other shops may specialize in certain equipment — scuba diving equipment, skis.

The owner must be able to plan ahead and know when certain products will be in demand. For example, ski equipment must be ordered in plenty of time before the season begins.

The owner buys products at wholesale prices, then sells them at increased prices to make a profit. Out of the profits must come costs for wages, utilities, and rent.

Multiplication



4 cartons of Fizzle pop.
6 cans in each carton.
How many cans?

$$6 + 6 + 6 + 6 = 24 \text{ — an addition sentence}$$

$$4 \text{ groups of } 6 = 24$$

$$4 \times 6 = 24 \text{ — a multiplication sentence}$$

$$\begin{array}{r} 6 \\ \times 4 \\ \hline 24 \end{array}$$

There are 24 cans

Exercises

1. 3 boxes of transistor batteries.
4 batteries in each box.
How many batteries?



$$4 + 4 + 4 = 12 \text{ — an addition sentence}$$

$$3 \text{ groups of } 4 = 12$$

$$3 \times 4 = 12 \text{ — a multiplication sentence}$$

$$\begin{array}{r} 4 \\ \times 3 \\ \hline 12 \end{array}$$

There are 12 batteries.

2. Write addition and multiplication sentences.
How many pizzas?



$$\begin{array}{r} 2 \quad 2 \quad 2 \quad 6 \\ \blacksquare + \blacksquare + \blacksquare = \blacksquare \\ 3 \quad 2 \quad 6 \\ \blacksquare \times \blacksquare = \blacksquare \\ 6 \end{array}$$

There are 6 pizzas.

OBJECTIVE

To demonstrate the relationship between multiplication and addition

PACING

Level A All
Level B All
Level C All

RELATED AIDS

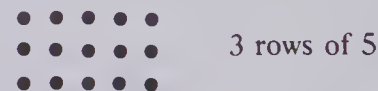
CALC. W/BK—5.

BACKGROUND

Multiplication is an operation involving two numbers called *factors* and a third number called the *product*.

In this chapter, multiplication is explained in two ways. First, it is related to repeated addition, e.g., $3 \times 5 = 5 + 5 + 5$. Secondly, multiplication can be visually demonstrated by grouping, e.g., 3×5 can be shown concretely or semiconcretely as 3 rows of 5 units each.

Example



SUGGESTIONS

This page should be done orally with the whole class. If students encounter no difficulty, you may wish to assign the next page (page 62).

Using the Book Use the display to develop these ideas:

1. Multiplication can be thought of as repeated addition (e.g., 6 cans plus 6 cans plus 6 cans ...).
2. Each repeated set or group contains the same number of elements or items (e.g., each carton contains 6 cans).
3. Multiplication can be shown in the more abstract sense both horizontally and vertically.

ACTIVITIES

1. Permit students to create their own problem situations with real or imagined products.

Example

5 cartons of "Fritter Critters".
6 boxes in each carton.
How many boxes altogether?

2. Prepare (or have children help) a deck of cards (about 60) showing repeated addition, multiplication, and dot pictures for various arrays.

$$3 \times 5 = 15$$

$$\begin{array}{r} 5 \\ 5 \\ + 5 \\ \hline 15 \end{array}$$



$$2 \times 9 = 18$$

$$9 + 9 = 18$$



Use the deck to play "Multi-Rummy" (2-4 players). Shuffle and deal 9 cards per player. Each player takes a turn exchanging a card in hand for the top card from either the deck or discard pile. The winner is the first player to collect 3 complete groups of matching cards.

3. Use cards as described above to play "Concentration" as explained in the Activity Reservoir.

OBJECTIVE

To write a multiplication sentence for a related addition sentence and vice versa

PACING

Level A All
Level B All
Level C All

SUGGESTIONS


Initial Activity You might begin this lesson with a chalkboard quiz, asking students to help you write the missing portions.

Example

\times	+
3×2	$2 + 2 + 2$
4×3	?
2×5	?
?	$4 + 4 + 4 + 4$
?	$6 + 6 + 6$
4×1	?

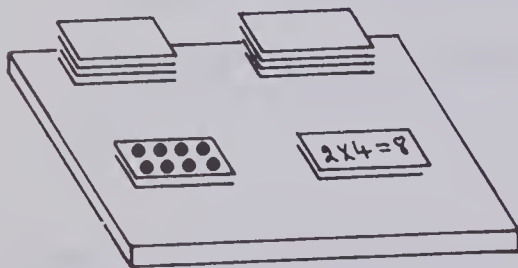
You might have students draw an array for each set.

Example

2×5 $5 + 5$ 

ACTIVITIES

1. Use a deck of cards as described on page 61, Activity 2, to play "Equals" (2-3 players). Shuffle and divide deck into 2 equal piles, face down on table. Each player takes a turn simultaneously turning over the top card from each deck. If the two exposed cards are equal, that player identifies these as "Equal" and scores one point. First player to reach 3 points is the winner.



Game can be speeded up by allowing each player to flip pairs of cards 3 times per turn and allowing other players to identify missed matches.

2. Using a ditto or the chalkboard, challenge students to play "Find My Name".

Example

"Circle each name you can find for 24."

Multiplication and Addition

Use multiplication.

- 6 packages of light bulbs.
2 light bulbs in each package.
How many light bulbs? 12



- The parking lot is full.
How many cars? 15



- Write a multiplication sentence for each addition sentence. Solve.

(a) $2 + 2 + 2 + 2 + 2 = \blacksquare$
 $5 \times 2 = 10$

$3 + 3 + 3 + 3 = \blacksquare$ $4 \times 3 = 12$

$6 + 6 + 6 = \blacksquare$ $3 \times 6 = 18$

$5 + 5 + 5 + 5 = \blacksquare$ $4 \times 5 = 20$

(e) $4 + 4 + 4 = \blacksquare$ $3 \times 4 = 12$

(f) $1 + 1 + 1 + 1 + 1 + 1 + 1 = \blacksquare$
 $7 \times 1 = 7$

(g) $7 + 7 = \blacksquare$ $2 \times 7 = 14$

(h) $3 + 3 + 3 + 3 + 3 = \blacksquare$ $5 \times 3 = 15$

(i) $4 + 4 + 4 + 4 = \blacksquare$ $4 \times 4 = 16$

(j) $8 + 8 + 8 = \blacksquare$ $3 \times 8 = 24$

- Write an addition sentence for each multiplication sentence.

(a) $4 \times 3 = \blacksquare$
 $3 + 3 + 3 + 3 = 12$

$2 \times 6 = \blacksquare$
 $6 + 6 = 12$

$2 \times 5 = \blacksquare$
 $5 + 5 = 10$

(d) $5 \times 3 = \blacksquare$
 $3 + 3 + 3 + 3 + 3 = 15$

(e) $7 \times 2 = \blacksquare$
 $2 + 2 + 2 + 2 + 2 + 2 + 2 = 14$

(f) $4 \times 4 = \blacksquare$
 $4 + 4 + 4 + 4 = 16$

(g) $6 \times 3 = \blacksquare$
 $3 + 3 + 3 + 3 + 3 + 3 = 18$

(h) $3 \times 8 = \blacksquare$
 $8 + 8 + 8 = 24$

(i) $2 \times 9 = \blacksquare$
 $9 + 9 = 18$

(j) $5 \times 5 = \blacksquare$
 $5 + 5 + 5 + 5 + 5 = 25$

(k) $8 \times 1 = \blacksquare$
 $1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 = 8$

(l) $3 \times 7 = \blacksquare$
 $7 + 7 + 7 = 21$

(m) $4 \times 6 = \blacksquare$
 $6 + 6 + 6 + 6 = 24$

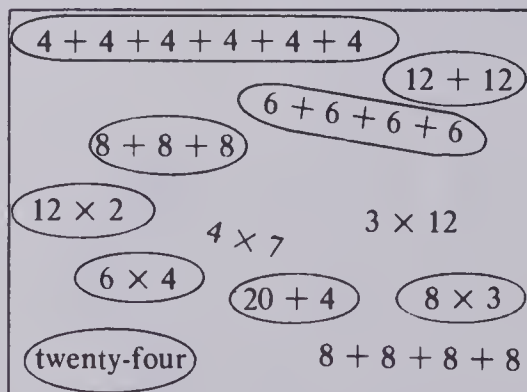
(n) $3 \times 5 = \blacksquare$
 $5 + 5 + 5 = 15$

(o) $5 \times 4 = \blacksquare$
 $4 + 4 + 4 + 4 + 4 = 20$

62 Relating addition and multiplication

Using the Book Use this page as a direct application of the previous page (page 61).

Exercises 1 and 2 could be done orally, or at the chalkboard. Assign Exercises 3 and 4 for independent work.



3. Use 2 dice (numbered 1-6) to play "Multi-Match" (2-4 players). One player rolls both dice. Next player in rotation must write either the repeated addition or multiplication sentence which matches the multiplication

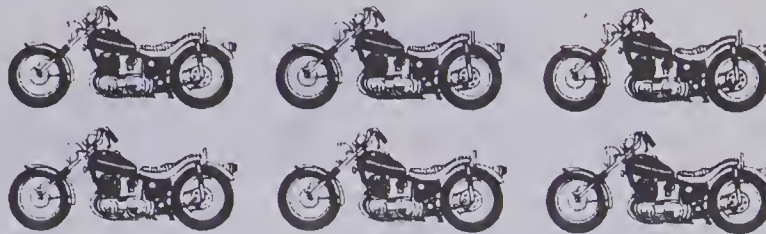
statement suggested by the 2 numerals rolled. That person scores the number of points suggested by the product (or sum) and rolls dice for next player. Winner is first player to score a total of 150.



Next player writes either $2 \times 5 = 10$ or $5 + 5 = 10$. Player scores 10.

Factors and Products

6 motorcycles.
2 wheels on each.
How many wheels?



Factor
Factor
Product
 $6 \times 2 = 12$

2 Factor
 $\times 6$ Factor

12 Product

Numbers multiplied together are called **factors**.

The answer is called the **product**.

Exercises

Write the product. Draw pictures if you need them.

- | | | | | |
|--|---|---|---|---|
| 1. $2 \times 4 = 8$ | 2. $5 \times 2 = 10$ | 3. $3 \times 6 = 18$ | 4. $4 \times 3 = 12$ | |
| 5. $4 \times 4 = 16$ | 6. $6 \times 1 = 6$ | 7. $3 \times 3 = 9$ | 8. $2 \times 6 = 12$ | |
| 9. $5 \times 7 = 35$ | 10. $1 \times 7 = 7$ | 11. $2 \times 2 = 4$ | 12. $3 \times 5 = 15$ | |
| 13. $4 \times 6 = 24$ | 14. $3 \times 8 = 24$ | 15. $2 \times 9 = 18$ | 16. $4 \times 8 = 32$ | |
| 17. $\begin{array}{r} 2 \\ \times 4 \\ \hline 8 \end{array}$ | 18. $\begin{array}{r} 7 \\ \times 2 \\ \hline 14 \end{array}$ | 19. $\begin{array}{r} 5 \\ \times 4 \\ \hline 20 \end{array}$ | 20. $\begin{array}{r} 3 \\ \times 8 \\ \hline 24 \end{array}$ | 21. $\begin{array}{r} 3 \\ \times 2 \\ \hline 6 \end{array}$ |
| 22. $\begin{array}{r} 5 \\ \times 1 \\ \hline 5 \end{array}$ | 23. $\begin{array}{r} 3 \\ \times 7 \\ \hline 21 \end{array}$ | 24. $\begin{array}{r} 6 \\ \times 5 \\ \hline 30 \end{array}$ | 25. $\begin{array}{r} 9 \\ \times 1 \\ \hline 9 \end{array}$ | 26. $\begin{array}{r} 5 \\ \times 5 \\ \hline 25 \end{array}$ |

Factors and products 63

Using the Book Use the display to introduce the terms "factor" and "product". Review the oral aspect of the multiplication sentence, e.g., $6 \times 2 = 12$ means six groups of two equal twelve.

Some students might benefit from drawing pictures to represent the first few exercises. Suggest that arrays would be used, emphasizing that multiplication is repeated addition.

Example

2×4 → "two groups or rows of four" → $\begin{array}{cccc} XXXX \\ XXXX \end{array}$

OBJECTIVES

To introduce and use the terms "factor(s)" and "product"
To write the products of single-digit factors

PACING

Level A All
Level B All
Level C All

VOCABULARY

factor(s), product (array(s))

RELATED AIDS

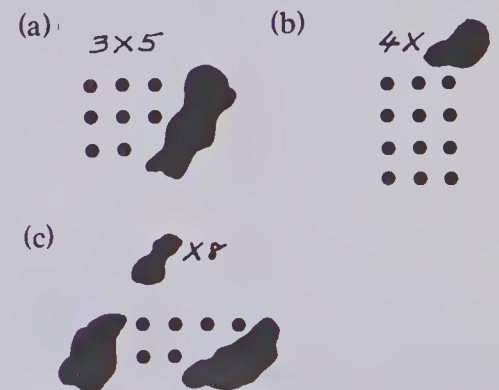
BFA COMP LAB II—29.

ACTIVITIES

1. Play the game "The Ink Blot Caper". Use a prepared ditto or chalkboard.

"Someone has put ink blots on these pictures. Complete the missing parts."

Example



Encourage students to make their own "Ink Blot Capers".

2. See "Flash" as described in the Activity Reservoir.

OBJECTIVE

To write the product when 0 or 1 are factors

PACING

Level A All
Level B All
Level C All

BACKGROUND

When 0 is a factor, the product is always 0. This is called the Property of Zero for Multiplication.

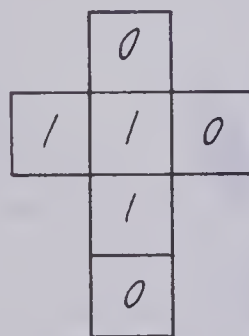
The product of any number and 1 is that number. This is the Property of One or the Identity Property of Multiplication.

ACTIVITIES

Play the "20's" game for 2 or more players.

1. Using a blank die, write the numbers 0 and 1 on opposite faces.

Example



Each player in turn has a total of five rolls of the die. The number "20" is multiplied by the factor on the upturned face of the die (e.g., 20×1 or 20×0). The player with the greatest score after five rolls wins. Perfect score is 100.

Example

	Susan	Tom
1.	0	20
2.	20	0
3.	20	0
4.	0	0
5.	20	20
Total	60	40

Variations:

(a) Player with the least score wins.

(b) Use numbers other than 20.

Shuffle an ordinary deck of playing cards. Each player draws five cards (where Ace = 1, Jack = 11, Queen = 12, King = 13, and other cards have their face value). A player rolls the die, and depending on the object of the game (greatest score or least score), multiplies any one of the five cards by the number of the upturned face of the

Multiplying by 0 and 1



5 snowmobiles.
1 rider for each snowmobile.
How many riders?

$$1 + 1 + 1 + 1 + 1 = 5$$

$$5 \text{ groups of } 1 = 5$$

$$5 \times 1 = 5$$

There are 5 riders.

$$\begin{array}{r} 1 \\ \times 5 \\ \hline 5 \end{array}$$



4 fish bowls.
No fish in each bowl.
How many fish?

$$0 + 0 + 0 + 0 = 0$$

$$4 \text{ groups of } 0 = 0$$

$$4 \times 0 = 0$$

There are 0 fish.

$$\begin{array}{r} 0 \\ \times 4 \\ \hline 0 \end{array}$$

Exercises

1. What happens when 1 is one of the numbers you multiply? The answer is the number you are multiplying by 1

$$\bullet 6 \times 1 = 6$$

$$\bullet 3 \times 1 = 3$$

$$\begin{array}{r} (c) \quad 1 \\ \times 5 \\ \hline 5 \end{array}$$

$$\begin{array}{r} (d) \quad 1 \\ \times 8 \\ \hline 8 \end{array}$$

2. What happens when 0 is one of the numbers you multiply? The answer is 0.

$$\bullet 7 \times 0 = 0$$

$$\bullet 4 \times 0 = 0$$

$$\begin{array}{r} (c) \quad 0 \\ \times 6 \\ \hline 0 \end{array}$$

$$\begin{array}{r} (d) \quad 0 \\ \times 3 \\ \hline 0 \end{array}$$

3. Write the products.

$$\bullet \begin{array}{r} 4 \\ \times 1 \\ \hline 4 \end{array}$$

$$\bullet \begin{array}{r} 0 \\ \times 4 \\ \hline 0 \end{array}$$

$$(c) \begin{array}{r} 1 \\ \times 7 \\ \hline 7 \end{array}$$

$$(d) \begin{array}{r} 0 \\ \times 9 \\ \hline 0 \end{array}$$

$$(e) \begin{array}{r} 0 \\ \times 5 \\ \hline 0 \end{array}$$

$$(f) \begin{array}{r} 1 \\ \times 9 \\ \hline 9 \end{array}$$

$$(g) 8 \times 0 = 0$$

$$(h) 1 \times 0 = 0$$

$$(i) 1 \times 1 = 1$$

$$(j) 0 \times 0 = 0$$

64 Multiplying by zero and one

Using the Book Use the display to show what happens when a number is multiplied by one or zero. Encourage students to describe what happens in each case. You might ask students if they can devise an array to show:

- 5×1 \longrightarrow X X X X X
- 4×0 \longrightarrow ?

The difficulty of designing an array for the second example reinforces the idea that when one of the factors is zero, the product is zero.

die. Play continues until the five cards have been used.

2. Add some 0 and 1 combinations to the Flash Card Set started on page 63, Activity 2.

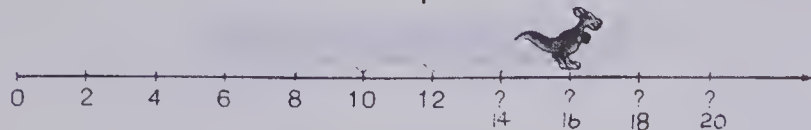
3. If a mini-calculator is available, some students might like to explore multiplication by 1 and 0 using greater numbers, that is, to see if the rules always hold true.

Example

$$341 \times 0, \quad 256 \times 1, \quad 1 \times 2473, \quad 0 \times 63293.$$

Counting

The number line shows some **multiples** of 2



Write the next four multiples of 2.

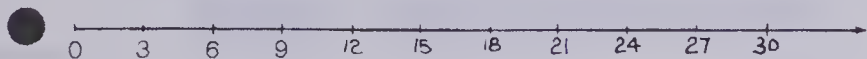
Rule

We add 2 each time to get the next number.

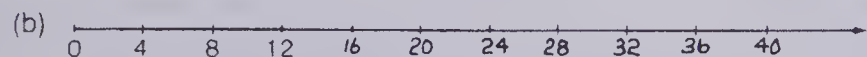
Exercises

1. Continue the patterns below by giving the next seven multiples.

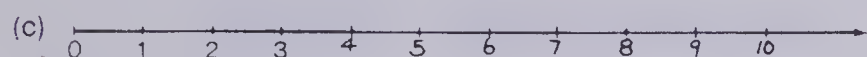
Rule



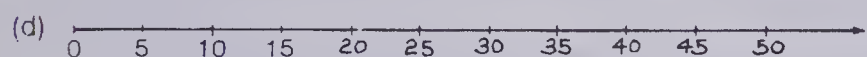
Add 3.



Add 4.



Add \blacksquare 1



Add \blacksquare 5

2. Continue the patterns below by giving the next seven multiples.

Rule

32, 40, 48, 56, 64, 72, 80

8, 16, 24, \blacksquare , \blacksquare , \blacksquare , \blacksquare , \blacksquare , \blacksquare

Add \blacksquare 8

24, 30, 36, 42, 48, 54, 60

(b) 6, 12, 18, \blacksquare , \blacksquare , \blacksquare , \blacksquare , \blacksquare , \blacksquare

Add \blacksquare 6

36, 45, 54, 63, 72, 81, 90

(c) 9, 18, 27, \blacksquare , \blacksquare , \blacksquare , \blacksquare , \blacksquare , \blacksquare

Add \blacksquare 9

28, 35, 42, 49, 56, 63, 70

(d) 7, 14, 21, \blacksquare , \blacksquare , \blacksquare , \blacksquare , \blacksquare , \blacksquare

Add \blacksquare 7

Counting practice, multiples 65

Using the Book Relate the experiences with the counters to the number line in the display, emphasizing the idea that we are adding identical groups.

Complete Exercises 1(a) and 2(a) orally. The answers for these two exercises are in the back of the book.

You may wish to encourage the children to look up the answers in order to (a) check the accuracy of the oral answers, and (b) see a model of the way the remaining exercises should be completed.

ACTIVITIES

1. Play "Ulti-Multi" (2-4 players). Prepare a game board as shown and a set of cards which will complete the patterns. Shuffle the cards and distribute *evenly* among all players.

2,	4,	6,	\square ,	\square ,	\square ,	U	\square
4,	8,	12,	\square ,	\square ,	\square ,	L	\square
9,	18,	27,	\square ,	\square ,	\square ,	T	\square
5,	10,	15,	\square ,	\square ,	\square ,	I	\square
						M	\square
						U	
						L	

etc.

Left-over cards should be turned face up and used by any player during his or her turn when needed. Each player takes a turn placing a card into its correct vacant position in a multiple row. A player may fill a position only if the lesser multiples in that row are already showing (i.e., on the board as shown, a "16" card may be placed only in the multiples of 4 row). Play continues till someone completes a multiple row. That player scores 1 point. The player with the most points, when all multiples are placed, is the winner.

(Continued on page 66)

OBJECTIVE

To further develop the relationship between multiplication and addition by using the patterns of multiples

PACING

Level A All
Level B All
Level C All

VOCABULARY

multiple(s)

MATERIALS

counters

RELATED AIDS

CALC. W/BK—6.

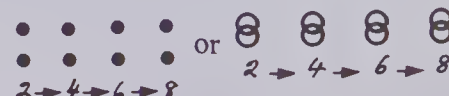
SUGGESTIONS

Initial Activity Provide each student with counters. Encourage them to discover how they can count identical groups using the counters. (Some students will use their knowledge of arrays to help.)

Example



(Others may stack the counters or develop their own type of array.)



Have the students develop a rule that indicates what they are doing with each group, e.g., "Add 2."

Try various examples using different multiples. Ask students to describe the groups in their "arrays", and the rule.

Example



"5 groups of 3
Add 3."

or "5 groups of 3
Add 3."



and so on ...

Be sure to identify the resulting numbers as "multiples".

OBJECTIVE

To introduce basic multiplication facts from the 2 to the 6 times table using multiples

PACING

Level A All

Level B All

Level C All

VOCABULARY

multiple strip(s)

MATERIALS

counters

RELATED AIDS

CALC. W/BK—6.

SUGGESTIONS

Initial Activity Review the arrays and rules as mentioned in the Initial Activity for page 65.

ACTIVITIES

1. Some students may have begun to show some competency with the basic multiplication facts used on this page. Encourage them to develop their own multiple strips using a random order for the factors.

Example

$\times 2$	5	1	10	3	0	7	6	9	2	4	8

Have them laminated so that water-soluble markers may be used. These could be exchanged with classmates.

2. Provide the students with a grid as illustrated below.

Example

Complete each multiplication, then add each row, column, and diagonal. What is each sum? (45) Is this a magic square? (yes)

3×8	1×3	2×9
1×9	5×3	3×7
4×3	3×9	2×3

3. Play "Ulti-Multi" as described in the Activities section, page 65.

Multiple Strips

1. Use multiples to help you complete these multiple strips.

$\times 2$	0	1	2	3	4	5	6	7	8	9	10
	0	2	4	6							

Multiples of \blacksquare 2

(b) $\times 3$	0	1	2	3	4	5	6	7	8	9	10
	0				12						

Multiples of \blacksquare 3

(c) $\times 4$	0	1	2	3	4	5	6	7	8	9	10
	0								32		

Multiples of \blacksquare 4

(d) $\times 5$	0	1	2	3	4	5	6	7	8	9	10
	0							35			

Multiples of \blacksquare 5

(e) $\times 6$	0	1	2	3	4	5	6	7	8	9	10
	0	6	12				36				

Multiples of \blacksquare 6

2. Tell what multiples are being used in each pattern.

- (a) 8, 10, 12, 14, ... Multiples of 2
 (b) 15, 20, 25, 30, ... Multiples of 5
 (c) 21, 28, 35, 42, ... Multiples of 7
 (d) 10, 20, 30, 40, ... Multiples of 10.

66 Counting practice, multiples

Using the Book Relate the counting patterns (multiples) used on page 65 to the multiple strips on this page. As students complete the strips, encourage them to relate each multiple (product) to its related factors.

Example

8 \rightarrow 2×4 ,
 10 \rightarrow 2×5 ,
 12 \rightarrow 2×6 , and so on.

(Continued from page 65)

Variation:

Instead of scoring 1 point, score the same number as the multiple value for that row — 2 points for the 2's row, etc.

2. Prepare a set of multiples cards which do *not* start with the lowest multiple. Have children sort and place them in the correct order.

Example

16, 20, 24;
 28, 35, 42;
 60, 70, 80; etc.

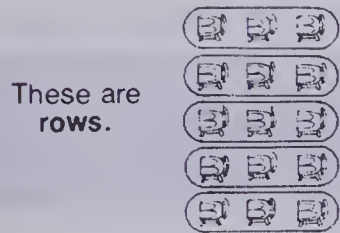
Rows and Columns

5 rows of chairs.
3 in each row.

$$3 + 3 + 3 + 3 + 3 = 15$$

$$5 \text{ groups of } 3 = 15$$

$$5 \times 3 = 15$$



There are 15 chairs.

3 columns of chairs.
5 in each column.

$$5 + 5 + 5 = 15$$

$$3 \text{ groups of } 5 = 15$$

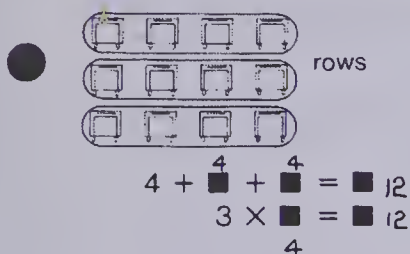
$$3 \times 5 = 15$$

These are **columns**.

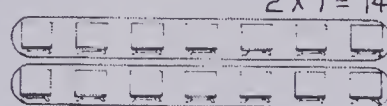


Exercises

Draw these arrays. Show *two* ways to multiply.
Write number sentences as shown.



2. rows



$$7 + 7 = 14$$

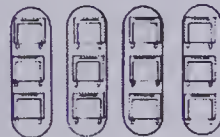
$$2 \times 7 = 14$$

columns



$$2 + 2 + 2 + 2 + 2 + 2 + 2 = 14$$

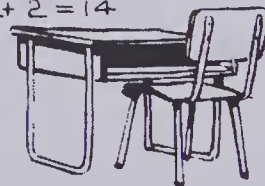
columns



$$3 + 3 + 3 + 3 = 12$$

$$4 \times 3 = 12$$

$$3 \times 4 = 12$$



$$7 \times 2 = 14$$

Commutativity 67

OBJECTIVE

To write two related multiplication sentences from a given array

PACING

Level A All
Level B All
Level C All

VOCABULARY

row(s), column(s)

MATERIALS

counters, overhead projector

SUGGESTIONS

Initial Activity Set up an array of counters on the overhead projector. Have students copy the array at their desks using counters. Establish the terms "row" and "column". Ask students to describe their arrays based on identical groups. Provide the opportunity for pupils to discover that there are two groups.

Example

1. 2 groups of 3 (row) →

2. 3 groups of 2 (column) →

Ask students to translate these into addition and multiplication form.

Example

$3 + 3$, $2 + 2 + 2$, 2×3 , 3×2 .

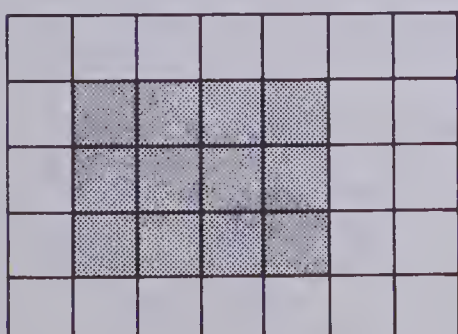
1. 2×3
 $3 + 3$

2. 3×2
 $2 + 2 + 2$

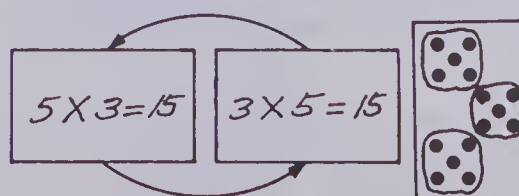
Bring out the point that, regardless of the choice of description, the total number of counters remains the same. This provides a concrete example of the Order Principle (Commutative Property), e.g., $2 \times 3 = 3 \times 2$.

ACTIVITIES

1. Have students design their own arrays and exchange with a classmate. The classmate then identifies the two multiplication and addition sentences for that array. Stress that neatness is important. Grid paper could also be used to help show a representation of multiplication.



- $3 \times 4 = 12$
 $4 + 4 + 4 = 12$
- $4 \times 3 = 12$
 $3 + 3 + 3 + 3 = 12$
- Play "Multi-Rummy" as described in the Activities section of page 61. Make the game more relevant by replacing the repeated addition cards from the deck with related multiplication sentences.



- Play "Concentration" as described in the Activity Reservoir using cards such as: $4 \times 5 = 20$, $5 \times 4 = 20$.

OBJECTIVE

To apply the Order Principle of Multiplication (Commutative Property) to find missing products

PACING

Level A All

Level B All

Level C All

VOCABULARY

Order Principle of Multiplication

BACKGROUND

It is not intended that students should memorize the term "Order Principle of Multiplication". Rather, students should be aware that the order of factors can be changed without affecting the product, and that this principle can be used in finding "new" multiplication facts. (You may want to review the Order Property of Addition on page 12.)

SUGGESTIONS

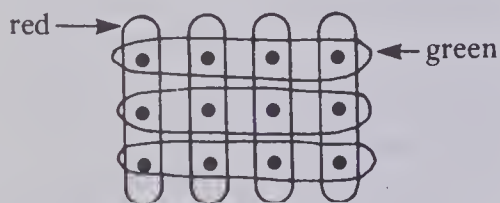
Initial Activity Draw an array on the chalkboard and briefly review the fact that while we can identify two different groups, the total number of things in the array remains the same.

ACTIVITIES

1. Ask students to draw arrays for Exercises 3-5 and show by circling with two coloured pencils that the Order Principle holds for multiplication.

Example

$$3 \times 4 = 4 \times 3$$



Some students may wish to make arrays using stickers, and circle the arrays with coloured yarn. These could be used for a bulletin board display.

2. Some children may wish to use a mini-calculator to show that the Order Principle holds true for greater numbers.

Example

$$24 \times 136 = 136 \times 24$$

3. To provide a challenge for those who have grasped the ideas of commutativity, prepare an exercise such as:

$$2 \times 6 = \square$$

$$6 \times 2 = \square$$

$$3 \times 7 = \square$$

$$4 \times 5 = \square$$

$$8 \times 4 = \square$$

$$8 \times 2 = \square$$

$$5 \times 8 = \square$$

$$6 \times \square = 18$$

$$8 \times \square = 8$$

$$\square \times 5 = \square$$

$$\square \times 10 = \square$$

$$7 \times \square = 21$$

$$\square \times 4 = 20$$

$$\square \times 8 = 32$$

$$2 \times \square = \square$$

$$8 \times \square = \square$$

$$\square \times \square = 18$$

$$\square \times \square = 8$$

$$5 \times 3 = \square$$

$$10 \times 1 = \square$$

The Order Principle

Find the missing **products**.

$$2 \times 6 = \square \quad 12$$

$$6 \times 2 = \square \quad 12$$

$$5 \times 4 = \square \quad 20$$

$$4 \times 5 = \square \quad 20$$

$$3 \times 6 = \square \quad 18$$

$$6 \times 3 = \square \quad 18$$

What did you notice about the pairs of products? They are the same.

What did you notice about the pairs of factors? The order of the factors changed.

The order principle of multiplication says:

"Changing the order of the factors does not change the product."

Exercises

Use the *order principle* to help you find the missing products.

If I know that:

$$\bullet 1 \times 2 = 2$$

$$\bullet 2 \times 6 = 12$$

$$3. 4 \times 5 = 20$$

$$4. 3 \times 9 = 27$$

$$5. 4 \times 6 = 24$$

$$6. 8 \times 0 = 0$$

$$7. 5 \times 2 = 10$$

$$8. 3 \times 4 = 12$$

Then I know:

$$2 \times 1 = \square \quad 2$$

$$6 \times 2 = \square \quad 12$$

$$5 \times 4 = \square \quad 20$$

$$9 \times 3 = \square \quad 27$$

$$6 \times 4 = \square \quad 24$$

$$0 \times 8 = \square \quad 0$$

$$2 \times 5 = \square \quad 10$$

$$4 \times 3 = \square \quad 12$$

BRAINTICKLER

When I multiply me by myself, I appear in the product as the last digit.

A
× A
—
BA

Who am I? 5 or 6

68 Commutativity

Using the Book Assign the activity in the display, encouraging students to express in their own words what happens when the order of the factors is changed.

Assign Exercises 1-8.

Note that there are two possible solutions for the Braintickler.

$$\begin{array}{r} 5 \\ \times 5 \\ \hline 25 \end{array} \quad \text{and} \quad \begin{array}{r} 6 \\ \times 6 \\ \hline 36 \end{array}$$

Multiplication Table

Let's put some multiplication facts together.

×	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30					
7	0	7	14	21	28	35					
8	0	8	16	24	32	40					
9	0	9	18	27	36	45					
10	0	10	20	30	40	50					

The red row and column show $3 \times 4 = 12$.

The blue row and column show $4 \times 3 = 12$.

Copy the table and complete it.

Use the order principle to help you find the missing products.

Multiplication facts to 5×10 and 10×5 69

OBJECTIVE

To use the Order Principle of Multiplication to record related multiplication facts on a matrix

PACING

Level A All

Level B All

Level C All

MATERIALS

12×12 matrices (grids) or DM17

RELATED AIDS

HMS—DM17.

SUGGESTIONS

Initial Activity Provide students with a copy of a multiplication grid like the one in the display. For those students who are unsure, demonstrate how the grid works.

Using the Book Use the grid to demonstrate how pupils, by using the Order Principle, can use known facts to discover new facts, e.g., "Since I know that $3 \times 8 = 24$, then I know that $8 \times 3 = 24$." Students should check their work and correct any errors. Some students may wish to use the grid as a reference for the work on the following pages. These partially completed grids will be used again on pages 76 and 77.

ACTIVITIES

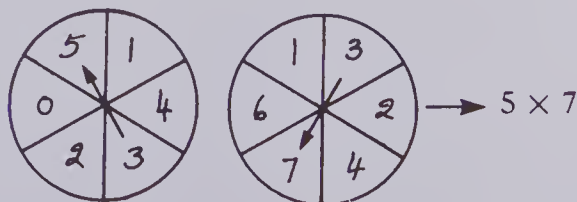
This would be an appropriate place to include multiplication in your regular drill program. In some cases you will want to provide drill for the whole class; in other cases it will be a matter of working with small groups or individuals.

Following are just a few devices that could be used.

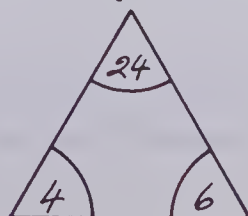
1. Student sets of fact cards, e.g., "the 1 facts", "the 2 facts", etc.
2. Dice.



3. Spinners.



4. Flash cards. (Triangular cards can be used for multiplication and division.)



(See "Flash" as described in the Activity Reservoir.)

5. Worksheets with missing factors and products.

$$\begin{array}{r} \blacksquare \\ \times 4 \\ \hline 32 \end{array} \quad \blacksquare \times 5 = 35 \quad 3 \times 7 = \blacksquare$$

6. "What's My Rule?"

3	12
5	20
2	8
8	?
6	?
1	?

(Multiply by 4.)

7. Electronic drill devices.

8. Mini-calculators. (E.g., Students work in pairs. First student presses 4×3 . Second student gives answer. The = key is pressed to check answer.)

OBJECTIVES

To practise basic multiplication facts of 2 and 3
To solve simple word problems

PACING

Level A All
Level B All
Level C All

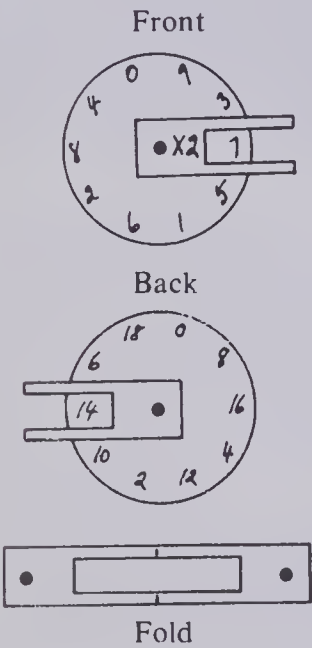
VOCABULARY

display, collection, samples

ACTIVITIES

1. Children might enjoy and benefit from constructing Multiplication Fact Wheels. Use Bristol board or shirt card-board.

Example



This illustration shows a fact wheel for the 2 times table. Wheels could be made for other tables.

Children could work in pairs. The first student turns the window to any number (e.g., 2×7). The second student gives the product. (14) A point is gained for each correct answer. Turns alternate. The answer to each question appears on the back of the wheel as shown.

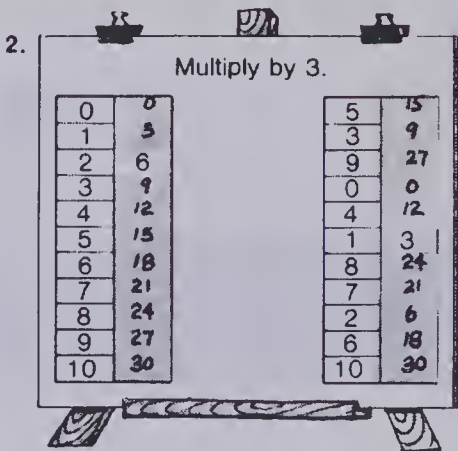
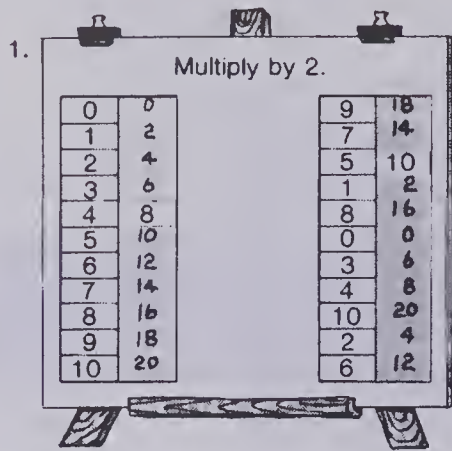
2. Prepare (have children help) some Fact Flip Cards (as shown). Children work their way through a card quickly, writing answers on a paper strip. Cards are self checking when turned over.

front	back
$2 \times 7 =$	14
$3 \times 5 =$	15
$8 \times 2 =$	16
$4 \times 4 =$	16
$6 \times 3 =$	18
etc.	etc.

Keep answers to right for easy matching.

Hobby Display

Complete the chart on each display stand.



Students set up displays to show their hobbies.

Read each mini-story, then solve.

- Coin Collection
3 pages.
6 coins on each page.
How many coins? 18
- Stamp Book
2 pages.
9 stamps on each page.
How many stamps? 18
- Rock Samples
2 boxes.
7 rocks in each box.
How many rocks? 14
- Glass Animals
3 display stands.
5 animals on each stand.
How many animals? 15
- Movie Posters
3 movies.
2 posters for each movie.
How many posters? 6
- Model Trucks
3 plastic transport trucks.
10 wheels on each.
How many wheels? 30

70 Practice and problems ($\times 2$, $\times 3$)

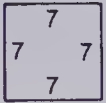
Using the Book Have the children look at each display stand. Emphasize that each number in the left-hand column of the charts is multiplied by the same factor (e.g., 2 or 3). Note also that numbers in the left portion of each are in "regular" order while those numbers in the corresponding right portion of each chart are in random order.

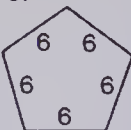
A sample question in each stand has already been completed. Have the children copy and complete. You may wish to complete a mini-story while showing the children what to do. Be sure to reinforce the format you wish the children to use when doing problems.

3. Play "Bingo" as described in the Activity Reservoir using Multiplication Facts.


Shapes and Games

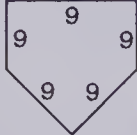
Read about these shapes and games, then solve.

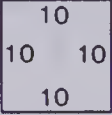
●  4 players.
7 cards each.
How many cards?
 $4 \times 7 = \blacksquare 28$


2.  5 players.
6 cards each.
How many cards?
 $5 \times 6 = \blacksquare 30$

Multiply to find how many cards in these games.

● 
 $4 \times 5 = 20$

4. 
 $5 \times 9 = 45$

5. 
 $4 \times 10 = 40$

6. 
 $5 \times 3 = 15$

7. Break the secret code and discover the message.

E	S	X	I	C	L	M	O	W	N	T	Z	U	P	F	A
8	15	17	20	6	18	24	12	21	9	16	5	10	14	11	35

Find the product for each multiplication phrase.

Write the code letter.

FIRST WORD (24) M (10) U (18) L (16) T (20) I (14) P (18) L (20) I
 4×6 5×2 3×6 4×4 10×2 2×7 6×3 5×4
 1×6 5×7 8×2 4×5 4×3 9×1
 (6) C (35) A (16) T (20) I (12) O (9) N
SECOND WORD 2×10 5×3 **THIRD WORD** 3×3 2×4 7×5 2×8
 (20) I (15) S (9) N (8) E (35) A (16) T



Practice and problems 71

Using the Book Some students may require assistance in starting Exercise 7. You might help them to decode the first two letters.

OBJECTIVE

To practise basic multiplication facts

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS—DM18.

ACTIVITIES

1. Some students might enjoy creating their own codes. They should start with single words, then expand, if they wish to use phrases, puns, sayings. Provide students with the following steps:

(a) Choose a word and write it in large black letters.

Example

BARBER

(b) Write a multiplication sentence for the first letter, placing the product under that letter and any others like it.

Example

B $4 \times 3 = 12$ **BARBER**
12 12

(c) Repeat Step (b) using different multiplication sentences until all letters have been assigned a product. Do in random order.

(d) Recopy portions of the code on another piece of paper and give to a classmate to decode.

Example

B 4×3

E 5×6

R 6×3 12 14 18 12 30 18

A 2×7

2. Provide students with a copy of this magic square and offer this challenge:

MAGIC SQUARE

8	1	6
3	5	7
4	9	2

Add each row, column, and diagonal. What is the sum? (15) Now multiply each number in the square by 4. Add the new numbers. (60) Is it still a magic square? (yes) Multiply each original number by 5. Add these new numbers. (75) Is it still a magic square? (yes)

EXTRA PRACTICE

See DM18.

OBJECTIVE

To identify numbers as odd or even

PACING

Level A All
Level B All
Level C All

VOCABULARY

odd, even, digits

ACTIVITIES

1. Children might enjoy developing generalizations for addition of odd and even numbers.

Example

4 (E)	5 (O)	6 (E)
+ 7 (O)	+ 9 (O)	+ 8 (E)
?	?	?

Have students check their generalizations with greater numbers.

2. Some students might enjoy playing "Change!" One student begins counting to 100 using only consecutive even numbers. As each multiple of 10 is reached (10, 20, 30, ...), the student says "Change!" and the next student must continue counting, using consecutive odd numbers.

Example

Student #1: 0, 2, 4, 6, 8, "Change!"

Student #2: 11, 13, 15, 17, 19, "Change!"

Student #3: 22, 24, 26, 28, "Change!" and so on.

3. Prepare a game board and die as shown to play "Odds-N-Evens".

ODDS-N-EVENS

START ↓	0	1	2	3	4	5	6	7	8	9	START ↑
	10	11	12	13	14	15	16	17	18	19	
	20	21	22	23	24	25	26	27	28	29	
	30	31	32	33	34	35	36	37	38	39	
	40	41	42	43	44	45	46	47	48	49	

Die faces: Lesser Even, Lesser Odd, Even, Odd, Greater Even, Greater Odd.

Each player (2-6) places a counter on either "Start" area and takes turns rolling the die. Winner is the first player to move to the opposite "Start" area while following instructions on die. Once started, players *must* move to an adjacent number.

A sample sequence for a player advancing from right to left:

Even and Odd Numbers

0	2	4	6	8	In this array: All red numbers are even. All blue numbers are odd.
10	12	14	16	18	
20	22	24	26	28	
30	32	34	36	38	
40	42	44	46	48	

Exercises

- What five different digits are in the *one's place* for even numbers? , , , , .
0 2 4 6 8
- What five different digits are in the *one's place* for odd numbers? , , , , .
1 3 5 7 9
- Make a rule that tells you whether a number is even or odd. Numbers ending in 0, 2, 4, 6, or 8 are even numbers. Numbers ending in 1, 3, 5, 7, or 9 are odd numbers.
Let's explore some patterns with even and odd numbers!
- Copy and complete these grids by multiplying. The first one is started.

(a) Even Odd

X	8	7
Even 2	16	14
Odd 5	40	35

(b) Even Odd

X	6	9
Even 4	24	36
Odd 3	18	27

(c) Even Odd

X	4	5
Even 2	8	10
Odd 3	12	15
- Are your products even or odd when you multiply:

an even × an even? **even**
 an odd × an even? **even**

an even × an odd? **even**
 an odd × an odd? **odd**

72 Even and odd numbers

Using the Book Exercises 1 and 2 could be done orally with the whole class. Have students distinguish between a "number" and a "digit".

Encourage students to state a rule in their own words for Exercise 3, e.g., "When the digit in the one's place is odd, the number is odd. When the digit in the one's place is even, the number is even."

Apply the rule to numbers written on the chalkboard.

Example

257 → 7 is odd ∴ 257 is an odd number.

4692 → 2 is even ∴ 4692 is an even number.

Assign Exercises 4 and 5 for individual work.

Roll	Move to
Even	no move yet
Greater Even	no move yet
Greater Odd	9, 19, 29, 39, or 49
Lesser Odd	19
Lesser Even	8 or 18
Even	8 or 28
Odd	27
Greater Odd	37
etc.	

Circled numbers indicate assumed choices.

Tiles

Joel placed tiles on his table.



How many tiles will he need to cover the table? 20

Exercises

How many tiles?



1 row of 5.

$$1 \times 5 = 5$$

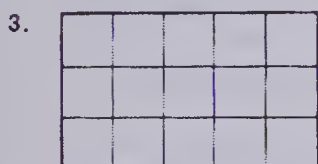
Is $1 \times 5 = 5 \times 1$? yes



2 rows of 5.

$$2 \times 5 = 10$$

Is $2 \times 5 = 5 \times 2$? yes



3 rows of 5.

$$3 \times 5 = 15$$

Is $3 \times 5 = 5 \times 3$? yes



4 rows of 5.

$$4 \times 5 = 20$$

Is $4 \times 5 = 5 \times 4$? yes

Square units in a rectangle 73

OBJECTIVE

To use multiplication in a problem situation

PACING

Level A All
Level B All
Level C All

BACKGROUND

While this page builds the basic concept of area of a rectangle, it is used here as an application of multiplication. However, capitalize on this opportunity to emphasize the value of multiplication. Area is developed later in this book (pages 267-272).

SUGGESTIONS

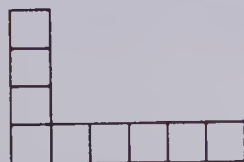
Initial Activity Prepare a set of tiles to cover some suitable object — teacher's desk, student desk, etc. as illustrated in the display. Discuss that it is not necessary to cover the whole area with tiles in order to calculate the number required. Since we know how many are needed in one row, we can calculate the number in 2 rows, 3 rows, 4 rows, etc. Do not at this time develop the $A = l \times w$ formula.

Using the Book Read through the display with the children. Ask, "How could Joel use multiplication to help find the number of tiles? (4 rows of 5 or 4 groups of 5)" "What multiplication sentence would he write? ($4 \times 5 = 20$)" "How many tiles are needed to cover the table? (20)"

Assign the exercises. Be certain children know how to write their answers.

ACTIVITIES

1. Provide the students with tiles. Ask them to make one row of 6, then place 3 more at right angles as shown.



Ask, "How many tiles do we need altogether to complete the rectangle?" Have the students write multiplication sentences. Repeat for other rectangles of different sizes.

2. Provide the students with 12 tiles. Ask how many different rectangles they can make using 12 tiles each time. (3) Repeat for different numbers of tiles.

3. Provide students with sheets of graph paper. Have them use ruler, pencil, and crayons to: (a) draw in various rectangles, (b) colour each, and (c) label each with a multiplication statement which identifies the correct number of squares. Selected work would make an attractive bulletin board display.

OBJECTIVE

To use the Multiplication-Addition Principle (Distributive Property) to "distribute" the first factor

PACING

Level A All
Level B All
Level C All

VOCABULARY

Multiplication-Addition Principle

MATERIALS

counters

BACKGROUND

It is not intended that students should memorize the term Multiplication-Addition Principle or express the principle in any algebraic form. Rather, students are encouraged to use the principle to find "new" multiplication facts.

Example

8×7 "I don't know the 8 or the 7 times table, but I can break apart ("distribute") the first factor and use factors I do know."

$$\begin{aligned} 8 \times 7 &= (4 \times 7) + (4 \times 7) \\ &= 28 + 28 \\ &= 56 \end{aligned}$$

Initial Activity Use counters to build various arrays in order to demonstrate concretely how the principle works.

Example

$$6 \times 4$$



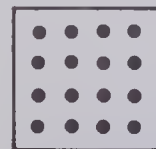
"This array shows 6 groups of 4 totalling 24."

"Using groups of 4, are there other ways to show a total of 24?"



$$2 \times 4$$

and



$$4 \times 4$$

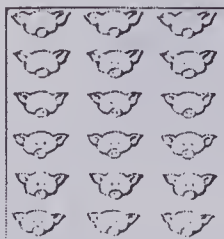
Encourage students to discuss and demonstrate other possibilities.

Example

$$(1 \times 4) + (5 \times 4), (3 \times 4) + (3 \times 4)$$

Multiplication-Addition Principle

This array shows 6 threes.



6 threes

This array also shows 6 threes.



3 threes
and
3 threes

Exercises

- Copy the array for 6 threes. 1 three and 5 threes, 2 threes and 4 threes, 3 threes and 3 threes, 4 threes and 2 threes, 5 threes and 1 three. Use your copies to write 6 threes in other ways.

- Find other ways to show each of the following. Use arrays to help you.

(a)



4 threes

1 three and 3 threes,
2 threes and 2 threes,
3 threes and 1 three

(b)



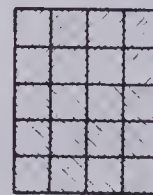
1 five and 5 fives,
2 fives and 4 fives,
6 fives

3 fives and 3 fives,
4 fives and 2 fives,
5 fives and 1 five

- Draw and colour rectangles on graph paper to show the different ways to write 5 fours. One way is done for you.



1 four and 4 fours,
2 fours and 3 fours,
5 fours
3 fours and 2 fours,
4 fours and 1 four



2 fours
and
3 fours

74 Distributive property

Using the Book Exercises 1-3 explore the semiconcrete or visual aspects of the principle. Exercises 4-6 deal with the related numerical aspects. Be certain that the students relate the corresponding parts of Exercises 5 and 6.

● Give the missing numbers.

6 fives is the same as: $\left\{ \begin{array}{ll} 3 \text{ fives and } \blacksquare \text{ fives} & 3 \\ \blacksquare \text{ fives and } 2 \text{ fives} & 4 \\ 2 \text{ fives and } \blacksquare \text{ fives} & 4 \\ 1 \text{ five and } \blacksquare \text{ fives} & 5 \\ \blacksquare \text{ fives and } 1 \text{ five} & 5 \end{array} \right.$

5. Sandy wrote: 7 fives is the same as 4 fives and 3 fives.

Bruce wrote: $7 \times 5 = (4 \times 5) + (3 \times 5)$.

Use Bruce's method to show:

- | | | |
|--------------|--------------|--------------|
| (a) 5 eights | (b) 4 eights | (c) 6 fives |
| (d) 4 threes | (e) 5 fours | (f) 6 sixes |
| (g) 8 twos | (h) 4 sevens | (i) 4 nines |
| (j) 3 eights | (k) 9 fives | (l) 6 eights |

6. Solve Bruce's equations in Question 5.

Bruce wrote: $7 \times 5 = (4 \times 5) + (3 \times 5)$
 $= 20 + 15$
 $= 35$

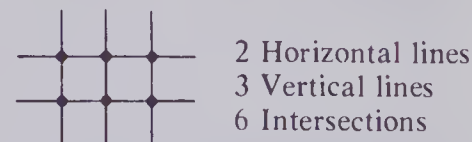
- | | | |
|------------------------------------|------------------------------------|------------------------------------|
| (a) $5 \times 8 = \blacksquare 40$ | (b) $4 \times 8 = \blacksquare 32$ | (c) $6 \times 5 = \blacksquare 30$ |
| (d) $4 \times 3 = \blacksquare 12$ | (e) $5 \times 4 = \blacksquare 20$ | (f) $6 \times 6 = \blacksquare 36$ |
| (g) $8 \times 2 = \blacksquare 16$ | (h) $4 \times 7 = \blacksquare 28$ | (i) $4 \times 9 = \blacksquare 36$ |
| (j) $3 \times 8 = \blacksquare 24$ | (k) $9 \times 5 = \blacksquare 45$ | (l) $6 \times 8 = \blacksquare 48$ |

Distributive property 75

ACTIVITIES

1. Students might enjoy investigating another kind of array — Lines and Intersections — that provide basic facts with a visual effect.

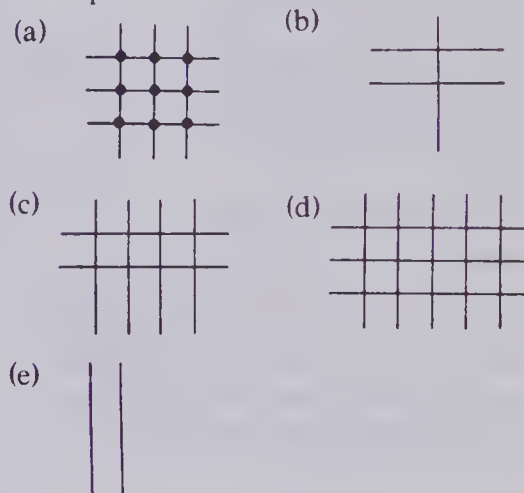
Example



$$2 \times 3 = 6$$

Provide a challenge similar to the one illustrated below.

"Complete the chart."



	(a)	(b)	(c)	(d)	(e)
Horizontal	3	2	2	3	0
Vertical	3	1	4	5	2
Intersections	9	2	8	15	0

Encourage students to construct their own lines and intersections and trade with a classmate. Some students may wish to use lines and intersections to picture a times table (e.g., 4 times table) using different coloured pencils.

2. Play "Toss 'N' Tell" as described in the Activity Reservoir for multiplication with this added twist: the player must tell what the product would be using Bruce's method as described on page 75.

3. Some children may wish to use a mini-calculator to show that the Distributive Property holds true for larger numbers.

Example

$$\begin{aligned} 130 \times 5 &= (100 \times 5) + (30 \times 5) \\ &= 500 + 150 \\ &= 650 \end{aligned}$$

ANSWERS

5. (a) $5 \times 8 = (1 \times 8) + (4 \times 8)$ or $(2 \times 8) + (3 \times 8)$ or $(3 \times 8) + (2 \times 8)$ or $(4 \times 8) + (1 \times 8)$
 (b) $4 \times 8 = (1 \times 8) + (3 \times 8)$ or $(2 \times 8) + (2 \times 8)$ or $(3 \times 8) + (1 \times 8)$ (c) $6 \times 5 = (1 \times 5) + (5 \times 5)$ or $(2 \times 5) + (4 \times 5)$ or $(3 \times 5) + (3 \times 5)$ or $(4 \times 5) + (2 \times 5)$ or $(5 \times 5) + (1 \times 5)$ (d) $4 \times 3 = (1 \times 3) + (3 \times 3)$ or $(2 \times 3) + (2 \times 3)$ or $(3 \times 3) + (1 \times 3)$ (e) $5 \times 4 = (1 \times 4) + (4 \times 4)$ or $(2 \times 4) + (3 \times 4)$ or $(3 \times 4) + (2 \times 4)$ or $(4 \times 4) + (1 \times 4)$ (f) $6 \times 6 = (1 \times 6) + (5 \times 6)$ or $(2 \times 6) + (4 \times 6)$ or $(3 \times 6) + (3 \times 6)$ or $(4 \times 6) + (2 \times 6)$ or $(5 \times 6) + (1 \times 6)$ (g) $8 \times 2 = (1 \times 2) + (7 \times 2)$ or $(2 \times 2) + (6 \times 2)$ or $(3 \times 2) + (5 \times 2)$ or $(4 \times 2) + (4 \times 2)$ or $(5 \times 2) + (3 \times 2)$ or $(6 \times 2) + (2 \times 2)$ or $(7 \times 2) + (1 \times 2)$ (h) $4 \times 7 = (1 \times 7) + (3 \times 7)$ or $(2 \times 7) + (2 \times 7)$ or $(3 \times 7) + (1 \times 7)$ (i) $4 \times 9 = (1 \times 9) + (3 \times 9)$ or $(2 \times 9) + (2 \times 9)$ or $(3 \times 9) + (1 \times 9)$ (j) $3 \times 8 = (1 \times 8) + (2 \times 8)$ or $(2 \times 8) + (1 \times 8)$ (k) $9 \times 5 = (1 \times 5) + (8 \times 5)$ or $(2 \times 5) + (7 \times 5)$ or $(3 \times 5) + (6 \times 5)$ or $(4 \times 5) + (5 \times 5)$ or $(5 \times 5) + (4 \times 5)$ or $(6 \times 5) + (3 \times 5)$ or $(7 \times 5) + (2 \times 5)$ or $(8 \times 5) + (1 \times 5)$ (l) $6 \times 8 = (1 \times 8) + (5 \times 8)$ or $(2 \times 8) + (4 \times 8)$ or $(3 \times 8) + (3 \times 8)$ or $(4 \times 8) + (2 \times 8)$ or $(5 \times 8) + (1 \times 8)$

OBJECTIVE

To use the Order and Multiplication-Addition Principles to record multiplication facts to 10×10 on a matrix

PACING

- Level A All
- Level B All
- Level C All

MATERIALS

partially completed multiplication grid

RELATED AIDS

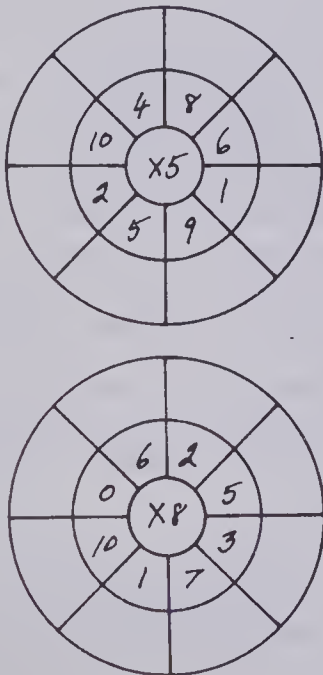
- HMS—DM17, 19, 20.
- BFA COMP LAB II—30.
- BFA PROB. SOLVING LAB II—Teaching Card B.

SUGGESTIONS

Initial Activity You may want to provide a brief review to show again how a factor can be “broken apart”, and used to produce partial products. Some students would benefit from a reminder about how the Order Principle works, too.

ACTIVITIES

1. You might provide students with Operation Wheels (DM19). After some practice, students might enjoy constructing their own and exchanging with a classmate.
Example



2. Extend the activity by incorporating some missing factors.

Completing the Table

x	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30					
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	A ⁶⁴	B ⁷²	C ⁸⁰
9	0	9	18	27	36	45	54	63	D ⁷²	E ⁸¹	F ⁹⁰
10	0	10	20	30	40	50	60	70	E ⁸⁰	H ⁹⁰	I ¹⁰⁰

1. Find the rest of the **six-facts** by using the multiplication-addition principle. Complete the red row.

$$\begin{aligned} 6 \times 6 &= (2 \times 6) + (4 \times 6) \\ &= 12 + 24 \\ &= 36 \end{aligned}$$

$6 \times 7 = \blacksquare 42$ $6 \times 8 = \blacksquare 48$ $6 \times 9 = \blacksquare 54$ $6 \times 10 = \blacksquare 60$

2. Use the order principle to help you complete the blue column.

\blacksquare Since $6 \times 7 = 42$, then $7 \times 6 = \blacksquare 42$

\blacksquare Since $6 \times 8 = 48$, then $8 \times 6 = \blacksquare 48$ **Blue**

\blacksquare Since $6 \times 9 = 54$, then $9 \times 6 = \blacksquare 54$

\blacksquare Since $6 \times 10 = 60$, then $10 \times 6 = \blacksquare 60$

76 Multiplication facts to 10×10

Using the Book Students should have their multiplication grids that were partially completed on page 69. Point out that the students will be using both the Order Principle and the Multiplication-Addition Principle to help them complete the grid. Emphasize that they can “use old facts to learn new facts”.

Use the multiplication-addition principle

3. (a) **Seven-facts:**

$$7 \times 7 = \blacksquare 49 \quad 7 \times 8 = \blacksquare 56 \quad 7 \times 9 = \blacksquare 63 \quad 7 \times 10 = \blacksquare 70$$

Place your new seven-facts in the green row.

(b) Use the order principle to complete the yellow column.

4. (a) **Eight-facts:**

$$8 \times 8 = \blacksquare 64 \quad 8 \times 9 = \blacksquare 72 \quad 8 \times 10 = \blacksquare 80$$

Replace A, B, and C with your new facts.

(b) Use the order principle to find the facts for D and E.

5. (a) **Nine-facts:**

$$9 \times 9 = \blacksquare 81 \quad 9 \times 10 = \blacksquare 90$$

Replace F and G with your new facts.

(b) Use the order principle to find the fact for H.

6. **Ten-facts:**

$$10 \times 10 = \blacksquare 100$$

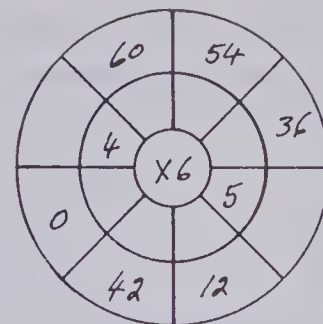
Replace I with your new fact.

7. Copy and complete.

$$\bullet 8 \times 9 = \blacksquare 72 \quad \bullet 9 \times 7 = \blacksquare 63 \quad \bullet 6 \times 10 = \blacksquare 60$$

$$(d) 7 \times 8 = \blacksquare 56 \quad (e) 9 \times 9 = \blacksquare 81 \quad (f) 8 \times 6 = \blacksquare 48$$

$$(g) 8 \times 8 = \blacksquare 64 \quad (h) 7 \times 6 = \blacksquare 42 \quad (i) 9 \times 10 = \blacksquare 90$$



3. Those students who enjoy open-ended assignments might enjoy investigating their completed multiplication table (or a dittoed copy) for patterns.

There are some obvious patterns.

Example

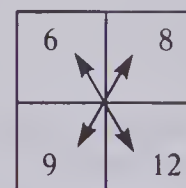
(a) 3rd row — multiples of 2

(b) 5th column — multiples of 4

There are other patterns that are less obvious.

Example

(a) a 2×2 square



$$6 + 12 = 18$$

$$9 + 8 = 17$$

a difference of 1

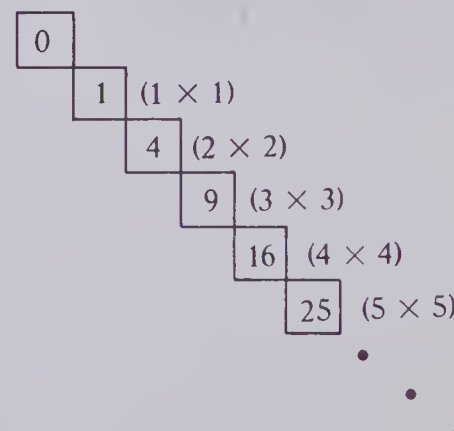
Does this hold true for other 2×2 squares?

(b) 2 adjacent columns

2	0	2	4	6	8	10	...
3	0	3	6	9	12	15	...
	0	5	10	15	20	25	

Find the sum for each pair. Are they multiples?

(c) Note the patterns of the central diagonal running from top left to lower right.



The numbers in this diagonal are perfect squares.

Encourage students to make a list of their discoveries and share with the class.

EXTRA PRACTICE

See DM20.

OBJECTIVE

To practise some basic multiplication facts

PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS—DM20 and DM21.
BFA PROB. SOLVING LAB II—45, 49, 53, 173, 214.

ACTIVITIES

- 1. For some further multiplication fact activities see DM21.
- 2. Play "Concentration" as described in the Activity Reservoir using cards such as:

5 × 5

25

3 × 6

18

- 3. Play "Flash" as described in the Activity Reservoir using cards such as:

21

3

7

16

4

4

18

2

9

30

6

5

EXTRA PRACTICE

See DM20.

Finding the Facts

Multiply.

- 1. (a) 3×5 15 (b) 2×8 16 (c) 0×7 0 (d) 6×8 48 (e) 4×3 12
- 2. (a) 10×8 80 (b) 3×9 27 (c) 8×4 32 (d) 7×7 49 (e) 1×1 1
- 3. (a) 9×5 45 (b) 2×3 6 (c) 1×7 7 (d) 5×6 30 (e) 3×7 21
- 4. (a) 7×6 42 (b) 3×10 30 (c) 8×8 64 (d) 4×6 24 (e) 5×4 20
- 5. (a) 9×7 63 (b) 4×9 36 (c) 3×0 0 (d) 5×8 40 (e) 6×6 36
- 6. (a) 6×2 12 (b) 7×4 28 (c) 10×10 100 (d) 9×9 81 (e) 8×3 24
- 7. (a) 4×4 16 (b) 5×7 35 (c) 6×9 54 (d) 5×5 25 (e) 9×8 72

Each correct "fact" is worth 1 point.
How do you rate?

FACT FINDER AWARDS

Fantastic Fact Finder	35 - 31 points
Fine Fact Finder	30 - 28 points
Favorable Fact Finder	27 - 24 points
Fair Fact Finder	23 - 21 points
More Practice	20 or less



78 Multiplication practice (to 10×10)

BRAINTICKLER

When I multiply me by myself,
the product is me again.

But my last digit is repeated.

 $AB \times AB = ABB$

Who am I? 10

Using the Book This page can be used as a mental and/or written exercise.
MENTAL: Read each multiplication phrase out loud, allowing students a suitable amount of time to write the product. You might assign this exercise at later times, gradually lessening the response time allowed.
WRITTEN: Have students work independently and record the product for each phrase. Students could note their starting and finishing times. Assign the exercises at various times. Stress that both speed and accuracy are important.
Variations:
(a) If this exercise is to be used more than once as a mental exercise, you might read the exercises in random order (e.g., Do Exercise 3, then Exercise 6, then Exercise 2, etc.) so that students do not develop a remembered pattern for the product.
(b) The multiplication grid contains 100 basic facts (excluding "zero" products and including related facts, e.g., $5 \times 3 = 15$, $3 \times 5 = 15$). Use a completed grid for a reference as you read the multiplication phrases so that students are provided with a variety of basic facts.

Multiplying by 1, 10, 100, 1000

What is the pattern?

$7 \times 1 = 7$	$63 \times 1 = 63$
$7 \times 10 = 70$	$63 \times 10 = 630$
$7 \times 100 = 700$	$63 \times 100 = 6300$
$7 \times 1000 = 7000$	$63 \times 1000 = 63\ 000$

Exercises

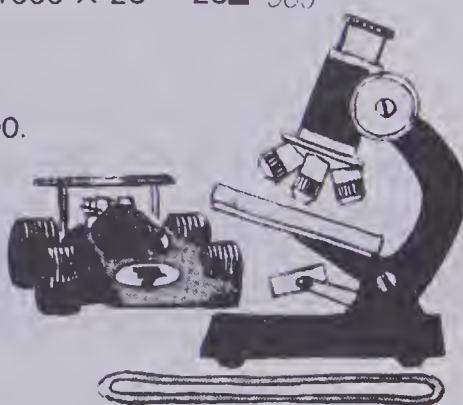
- Write the products.

$5 \times 1 = 5$	$1 \times 23 = 23$
$5 \times 10 = 5 \blacksquare 0$	$10 \times 23 = 23 \blacksquare 0$
$5 \times 100 = 5 \blacksquare 00$	$100 \times 23 = 23 \blacksquare 00$
$5 \times 1000 = 5 \blacksquare 000$	$1000 \times 23 = 23 \blacksquare 000$

- Write a rule to help you multiply by

1 10 100 1000.

- 24 boxes of 1 microscope each.
How many microscopes? *24*
- 37 boxes of 10 midget cars each.
How many midget cars? *370*
- 12 packages of 100 rubber bands each.
How many rubber bands? *1200*



Multiplying by powers of 10 **79**

OBJECTIVE

To write a product when one of the factors is 1, 10, 100, or 1000

PACING

Level A All
Level B All
Level C All

VOCABULARY

microscope

RELATED AIDS

CALC. W/BK—18.

ACTIVITIES

See page 80.

Using the Book Encourage pupils to explain verbally the patterns in the display. Exercise 1 could be done as a cooperative class effort. While it is beneficial to have students devise their own rules for Exercise 3, help them to avoid statements like, "Add a zero (two zeros, three zeros) to the number" (because $5 \times 10 = 5 + 10$).

Encourage rules similar to the following.

Example

$$5 \times 10 = 50$$

When a whole number is multiplied by 10:

- (a) "Annex a zero to the number,"

or

- (b) "Move the number one place to the left and annex a zero as a placeholder,"

or

- (c) "Move the decimal point one place to the right and use zero as a placeholder."

A suitable rule for multiplication by 1 might be, "When a number is multiplied by one, the number remains unchanged."

Do Exercises 3, 4, and 5 orally, then assign the exercises on page 80 for practice.

ANSWERS

- To multiply a number by 10 move the figures in the numeral 1 place to the left and put a 0 in the one's place.

To multiply a number by 100 move the figures in the numeral 2 places to the left and put a 0 in the one's and ten's places.

To multiply a number by 1000 move the figures in the numeral 3 places to the left and put a 0 in the one's, ten's, and hundred's places.

OBJECTIVE

To practise writing a product when one of the factors is 1, 10, 100, or 1000

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS—DM22.
BFA COMP LAB II—36.
CALC. W/BK—18.

BACKGROUND

The ability to efficiently multiply a number by 1, 10, 100, or 1000 is important. This skill is used for preliminary multiplication exercises (e.g., multiplying by multiples of 10—page 83, estimation—pages 84-85 and 93). It is applied to the multiplication algorithm (pages 87-91 and 94-96), and ultimately to the division algorithm in the following chapter. It also reinforces knowledge of our base-ten place-value system.

ACTIVITIES

1. Provide some oral practice by playing "What's my Product?"

(a) Use questions such as 7×10 , 16×100 , 8×1000 , and so on.

(b) Vary the approach by giving a product and asking for 2 factors, e.g.,
(i) $4000 \rightarrow 4 \times 1000$ (ii) $2300 \rightarrow 23 \times 100$.

(c) You might challenge more advanced students with another variation. Say, "The product is 4000. One of the factors is 100. What is the other factor?"

Example

$$40 \times 100 = 4000$$

2. Use an exercise similar to the one suggested below to maintain the skill discussed in the Background section above.

(a) Prepare a spinner or blank die with the numbers 1, 10, 100, 1000.

(b) Ask a student for his/her favourite number between 1 and 100 (e.g., 35).

(c) Spin the spinner (or roll die) to obtain the second factor (e.g., 100).

(d) Students multiply mentally and record product (e.g., 3500).

(e) Repeat Steps (b)-(d) for other numbers.

3. Play "What's Happening?" as described in the Activity Reservoir using rules such as multiply by 1, multiply by 10, multiply by 100, or multiply by 1000.

Multiplying by 1, 10, 100, 1000

1. Write the products.

\bullet $25 \times 1 = \blacksquare 25$	(b) $1 \times 7 = \blacksquare 7$	(c) $9 \times 1 = \blacksquare 9$
$25 \times 10 = \blacksquare 250$	$10 \times 7 = \blacksquare 70$	$9 \times 10 = \blacksquare 90$
$25 \times 100 = \blacksquare 2500$	$100 \times 7 = \blacksquare 700$	$9 \times 100 = \blacksquare 900$
$25 \times 1000 = \blacksquare 25\ 000$	$1000 \times 7 = \blacksquare 7000$	$9 \times 1000 = \blacksquare 9000$

2. Solve the following.

(a) One dollar = 10 dimes.

How many dimes for:

5 dollars? 50

25 dollars? 250

76 dollars? 760

145 dollars? 1450

(b) One metre = one hundred centimetres. $1\text{ m} = 100\text{ cm}$

How many centimetres in:

6 m? 600 cm

15 m? 1500 cm

65 m? 6500 cm

112 m? $11\ 200\text{ cm}$

(c) One box has 1000 bolts.

How many bolts in:

3 boxes? 3000

24 boxes? $24\ 000$

87 boxes? $87\ 000$

135 boxes? $135\ 000$

3. Extra practice. Write the products.

\bullet $10 \times 94 = \blacksquare 940$	\bullet $56 \times 100 = \blacksquare 5600$	\bullet $1 \times 19 = \blacksquare 19$
(d) $24 \times 1000 = \blacksquare 24\ 000$	(e) $43 \times 100 = \blacksquare 4300$	(f) $100 \times 56 = \blacksquare 5600$
(g) $400 \times 1 = \blacksquare 400$	(h) $23 \times 10 = \blacksquare 230$	(i) $118 \times 100 = \blacksquare 11\ 800$
(j) $52 \times 10 = \blacksquare 520$	(k) $1000 \times 18 = \blacksquare 18\ 000$	(l) $178 \times 10 = \blacksquare 1780$
(m) $1 \times 200 = \blacksquare 200$	(n) $3 \times 1000 = \blacksquare 3000$	(o) $100 \times 45 = \blacksquare 4500$

80 Multiplying by powers of 10

Using the Book Using the rules and patterns developed on page 79 as a basis, assign the exercises. Be certain that all students are familiar with an acceptable method for writing responses. The answers for Exercises 1(a), 3(a), 3(b), and 3(c) are in the back of the book (page 339).

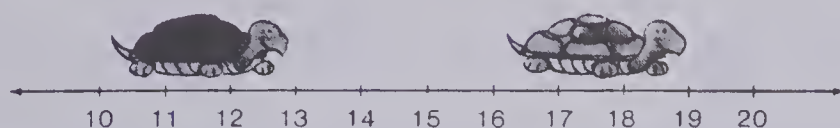
EXTRA PRACTICE

DM22.

Rounding Numbers

Is Redback closer to 10 or 20? 10

Is Blueback closer to 10 or 20? 20

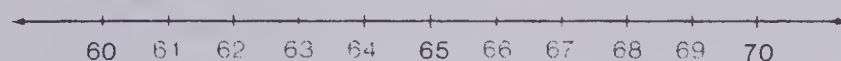


Exercises

- Which of the red numbers are closer to 40 than 50? 41, 42, 43, 44
Which are closer to 50? 46, 47, 48, 49

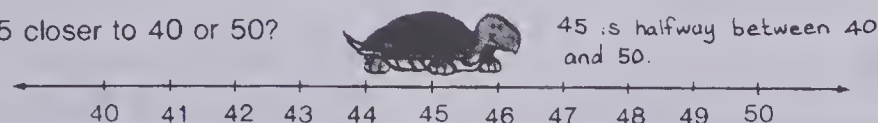


2. Round each red number to the nearest multiple of 10.



61 → 60 63 → 60 66 → 70 68 → 70
62 → 60 64 → 60 67 → 70 69 → 70

3. Is 45 closer to 40 or 50?



45 is halfway between 40 and 50.

A number halfway between two multiples of 10 is rounded to the greater multiple of 10.

45 rounds to 50

4. Round each number to the nearest multiple of 10.

● 42 40 ● 29 30 (c) 81 80 (d) 65 70 (e) 78 80 (f) 55 60

Rounding to the nearest multiple of 10 81

Using the Book Use the display to develop the idea of proximity of a number to a multiple of 10. Provide other examples by asking, "Is Redback closer to 10 or 20 if he stands on 13? on 14?"

If children are unfamiliar with the term "rounding", you might use the display to have them discover that we replace Redback's and Blueback's numbers with the nearest multiple of 10.

Be sure that students understand the implications of Exercise 3 — a "half-way" number like 15 is rounded up by general agreement.

Discourage students from using equal signs (e.g., $47 = 50$). Rather, use an arrow ($47 \rightarrow 50$) or introduce the symbol which means "is approximately equal to" ($47 \approx 50$).

Discuss what happens when numbers less than 10 are rounded: $9 \rightarrow 10$, $6 \rightarrow 10$, $5 \rightarrow 10$, $4 \rightarrow 0$, etc.

ACTIVITIES

1. Play "Round-off Bingo". Provide each student with a Bingo grid as shown below. Ask students to place these sixteen numbers at random in the cells of the grid. 10, 10, 20, 20, 30, 30, 40, 40, 50, 50, 60, 60, 70, 70, 80, 90.



OBJECTIVE

To round whole numbers less than 100 to the nearest multiple of 10

PACING

Level A All
Level B All
Level C All

VOCABULARY

round(ing)

SUGGESTIONS

Initial Activity Review with the students counting by 10's from any starting position.

Example

- (a) 30; 40, 50, 60, ...
(b) 4; 14, 24, 34, ...
(c) 27; 37, 47, 57, ...

Call out a number between 5 and 94. Students place an "X" or a marker in the cell that represents that number rounded-off. (E.g., If 24 was called students would locate a cell labelled 20 because $24 \approx 20$). Play continues until a student(s) has 4 cells covered horizontally, vertically, or diagonally.

Use the following as a list of call numbers; 17, 36, 23, 6, 94, 25, 48, 77, 59, 38, 52, 13, 56, 31, 66, 65.

Keep track of the numbers called so that you can check a student's work. **Variations:**

- (1) Winner is the first person (a) covering the 4 corner cells, (b) covering the 4 cells that form a central square.
(2) Increase the size of the grid to 5×5 , making the central cell a "free" zone. The winner is the first person to cover 5 cells horizontally, vertically, or diagonally.

2. Label a set of envelopes 10, 20, 30, ..., 90. Provide various number cards (about 30) from 5 to 94 inclusive. Task is to place the number cards in the appropriate envelopes when rounded to the nearest ten (e.g., a "27" card would go in the "30" envelope). This activity can be made more attractive and permanent by using labelled containers rather than envelopes, i.e., muffin tins, adjusted egg cartons, margarine containers.

EXTRA PRACTICE

Round each number to the nearest multiple of 10.

- (a) 42 (b) 29 (c) 81 (d) 65 (e) 56
(f) 73 (g) 37 (h) 64 (i) 25 (j) 94
(k) 14 (l) 88

OBJECTIVE

To use the Grouping Principle of Multiplication (Associative Property) to find the product of three factors

PACING

Level A All
Level B All
Level C All

VOCABULARY

Grouping Principle of Multiplication

BACKGROUND

The grouping of addends in addition does not affect the sum. Likewise, in multiplication, the grouping of the factors does not affect the product.

It is not intended that students should memorize the term Grouping Principle of Multiplication. Rather, students should be able to use the principle when multiplying with three factors.

SUGGESTIONS

Initial Activity To introduce this lesson, briefly review the Grouping Principle of Addition (pages 13 and 14). Using appropriate chalkboard examples, ask if the same principle holds true for multiplication.

Example

Addition

$$(5 + 2) + 3 = 7 + 3$$

$$= 10$$

$$5 + (2 + 3) = 5 + 5$$

$$= 10$$

Multiplication

$$(5 \times 2) \times 3 = 10 \times 3$$

$$= 30$$

$$5 \times (2 \times 3) = 5 \times 6$$

$$= 30$$

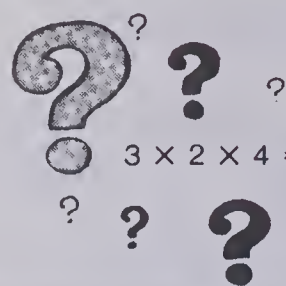
Students should be aware that (a) we can operate on only two numbers at a time and (b) we always perform the operation within parentheses (brackets) first.

ACTIVITIES

1. To play "250", prepare an appropriately sized game board as shown.

3	5	4	5	3
4	2	3	2	1
2	1	1	0	6
3	0	5	2	3
5	4	2	4	3

Players (2-4) flip 3 pennies, counters, or



Grouping Principle

Bill wrote: $3 \times (2 \times 4) = 3 \times 8$
 $= 24$

Anita wrote: $(3 \times 2) \times 4 = 6 \times 4$
 $= 24$

The grouping principle for multiplication says

"Changing the grouping of the factors does not change the product."

Exercises

1. Copy and complete.

(a) $1 \times (3 \times 2) = \blacksquare 6$
 $(1 \times 3) \times 2 = \blacksquare 6$

(c) $2 \times (4 \times 1) = \blacksquare 8$
 $(2 \times 4) \times 1 = \blacksquare 8$

(b) $(5 \times 2) \times 3 = \blacksquare 30$
 $5 \times (2 \times 3) = \blacksquare 30$

(d) $(5 \times 2) \times 4 = \blacksquare 40$
 $5 \times (2 \times 4) = \blacksquare 40$

2. Copy and complete.

(a) $(4 \times 2) \times 0 = \blacksquare 0$
(c) $3 \times 0 \times 2 = \blacksquare 0$
(e) $5 \times 2 \times 0 = \blacksquare 0$

(b) $0 \times (3 \times 5) = \blacksquare 0$
(d) $1 \times 2 \times 0 = \blacksquare 0$
(f) $6 \times 0 \times 1 = \blacksquare 0$

3. Copy and complete. Group in any way.

(a) $1 \times 2 \times 10 = \blacksquare 20$
(c) $3 \times 2 \times 10 = \blacksquare 60$
(e) $3 \times 1 \times 100 = \blacksquare 300$

(b) $2 \times 3 \times 10 = \blacksquare 60$
(d) $2 \times 2 \times 100 = \blacksquare 400$
(f) $3 \times 2 \times 100 = \blacksquare 600$

82 Multiplication 3 factors associativity

Using the Book Use the display to reinforce the idea that the principle works with multiplication as well. Because we can only work with two addends or factors at a time (binary operation), the principle permits us to group when there are three or more factors or addends. The brackets in the display indicate the choice made.

Bring out the point that grouping does not affect the product. Assign the exercises after having demonstrated the correct procedure with Exercises 1(a), 2(a), and 3(a).

buttons onto board and multiply to find their product. Players should keep a cumulative total of their products as this is their score. First player to exceed "250" is the winner.

Variations:

To lengthen, make more difficult, make winner reach a higher score or exactly 250 or start at 250 and try to reach zero.

2. See "Quad-Row", as described in the Activity Reservoir.

OBJECTIVE

To estimate the product where one factor is a 1-digit number and the second factor is rounded to the nearest multiple of 10

PACING

Level A All
Level B All
Level C All

VOCABULARY

estimate, guess, passengers, luggage, beacon

MATERIALS

counters, transparent jar or container

RELATED AIDS

BFA PROB. SOLVING LAB II—15.

BACKGROUND

Notice how concepts developed in earlier lessons are applied here in the display.

Example

$8 \times 94 \rightarrow 8 \times 90$ (Rounded off to the nearest multiple of 10)
 $\rightarrow 8 \times 9 \times 10$ (Renaming)
 $\rightarrow 72 \times 10$ (Basic multiplication fact)
 $\rightarrow 720$ (Known multiplication using multiples of 10)

SUGGESTIONS

Initial Activity Discuss with the children times when they have made a guess about something (e.g., time needed to reach a destination, number of people in a room, etc.). Emphasize that "careful guesses" or estimates are not considered to be right or wrong. Rather, some estimates are simply better than others. (E.g., To walk to the library, John estimates 10 min and Rita estimates 40 min. Actual walking time — 45 min. Rita's estimate is more reasonable.) Distribute slips of paper and ask the children to write their estimate of, for example, the number of (a) students in the class, (b) students in the school, (c) counters or marbles in a jar on display. When all estimates have been tabulated, disclose the actual amounts. Have the children compute how close their guesses actually were.

Estimating

An **estimate** is a careful guess.

Fred used estimates to learn things about the airport.

8 parking levels.

94 parking spaces for each level.

About how many cars are in the parking garage when it's full?

Fred thought: 8×94

Fred rounded off: 8×90 (94 rounded to the nearest 10.)

Fred estimated: $8 \times 90 = 720$

There is room for about 720 cars.



Multiples of 10 help us to estimate.

Exercises

Help Fred estimate.

- 5 runways.
78 lights on each runway.
About how many lights are there altogether?

Fred thought: 5×78

Fred rounded off: 5×80 (78 rounded to the nearest 10.)

Fred estimated: $5 \times 80 = 400$

There are about 400 lights.



Using the Book Use the display to develop the idea that we can use estimates (careful guesses) in multiplication too. Emphasize that rounding is an important skill in helping to estimate, and that estimation is often done mentally.

Read through the airport parking lot example with the children. Clarify what Fred was doing as he mentally prepared his estimate (i.e., rounding off for the sake of simplicity and then estimating). Emphasize the word "about" in the final statement. If necessary, complete Exercise 1 orally with the class reemphasizing the steps.

Assign the rest of the exercises. You may wish to mention that Exercise 5 gives no hints as to what to do. The children should continue the pattern to find the answer for this question. The answers for Exercises 6(a) and 7(a) are in the back of the book (page 339).

2. 92 passengers boarded a plane.
Each passenger carried 8 kg of luggage.
About how much luggage did the plane carry?

$$\begin{aligned} 8 \times 92 \\ 8 \times \blacksquare 90 \\ 8 \times \blacksquare = \blacksquare 720 \\ 90 \end{aligned}$$

3. 5 planes land every minute.
About how many land in 29 min?

$$\begin{aligned} 5 \times 29 \\ 5 \times \blacksquare 30 \\ 5 \times \blacksquare = \blacksquare 150 \\ 30 \end{aligned}$$

About \blacksquare planes land in 29 min.
150

4. Abigail Airlines owns 58 airplanes.
7 crew members for each airplane.
About how many crew members altogether?

$$\begin{aligned} 7 \times 58 \\ 7 \times \blacksquare 60 \\ 7 \times \blacksquare = \blacksquare 420 \\ 60 \end{aligned}$$

About \blacksquare crew members altogether.
420

6. Complete.

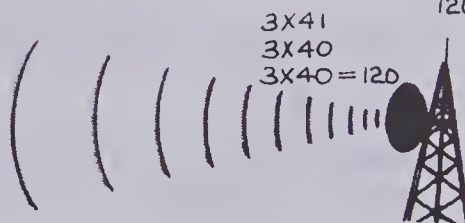
\bullet 8×43 (b) 4×71 (c) 6×35 (d) 9×28
 $8 \times 40 = 320$ $4 \times \blacksquare 70 = 280$ $6 \times \blacksquare 40 = 240$ $9 \times \blacksquare 30 = 270$

7. Estimate these products

\bullet 5×32 $5 \times 30 = 150$ (b) 8×49 $8 \times 50 = 400$ (c) 3×74 $3 \times 70 = 210$
 (d) 6×48 $6 \times 50 = 300$ (e) 4×83 $4 \times 80 = 320$ (f) 7×57 $7 \times 60 = 420$



5. A radio beacon has 41 sections.
Each section is 3 m high.
About how high altogether? about 120 m



ACTIVITIES

1. If you have not already done so as suggested in the Initial Activity for page 85, display several jars of marbles, centimetre cubes, erasers, etc. Challenge the children to see how close they can come with their guesses.

Variation:

Include jars of water and sand. Seek guessers as to capacity and mass. Besides the display jars, include samples of 1 mL of water, 1 g of sand, 5 marbles, 3 erasers, etc.

2. Prepare and distribute a matching exercise such as:
Connect each step with a solid line.

Thought	Rounded	Estimate
4×49	3×70	200
5×71	8×20	350
3×76	5×50	250
8×19	3×80	240
5×52	5×70	160
3×74	4×50	210

3. Place each "Thought", "Rounded", and "Estimate" numbers as suggested in Activity 2 above on its own card. Challenge the students to play "Triple Concentration". Rules for "Concentration" are in the Activity Reservoir. "Triple Concentration" requires 3 cards to be matched per set.

OBJECTIVE

To write the product of a 1-digit factor and a 2-digit factor by using the Multiplication-Addition Principle (no regrouping)

PACING

Level A All
Level B All
Level C All

BACKGROUND

Students are already familiar with using this principle to "break apart" a factor in order to more conveniently find a "new" multiplication fact (pages 74-75).

Example

$$\begin{aligned} 7 \times 6 &= (3 \times 6) + (4 \times 6) \\ &= 18 + 24 \\ &= 42 \end{aligned}$$

This lesson uses the principle to "break apart" a 2-digit factor and, in effect, lays the groundwork for the multiplication algorithm.

Example

$$\begin{aligned} 4 \times 26 &= 4 \times (20 + 6) \text{ (Renaming)} \\ &= (4 \times 20) + (4 \times 6) \\ &\quad \text{(Multiplication-Addition principle)} \\ &= 80 + 24 \text{ (Multiplication facts)} \\ &= 104 \text{ (Addition of partial products)} \end{aligned}$$

which leads to ... 26

$$\begin{array}{r} \times 4 \\ 24 \text{ (} 4 \times 6 \text{)} \\ 80 \text{ (} 4 \times 20 \text{)} \\ \hline 104 \end{array}$$

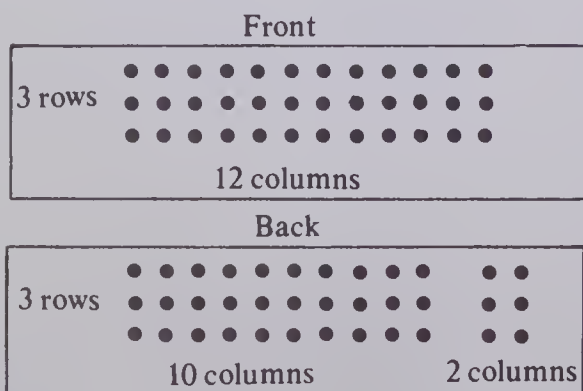
SUGGESTIONS

Initial Activity If necessary, review multiplication where one of the factors is a multiple of 10, e.g., 4×30 , 6×70 , 3×50 .

ACTIVITIES

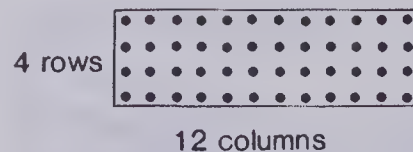
1. If you have not already done so, try the Activities for pages 74-75, some of which can be modified to include 2-digit numbers.

2. Provide (have the children help) a series of reversible dot picture cards such as:

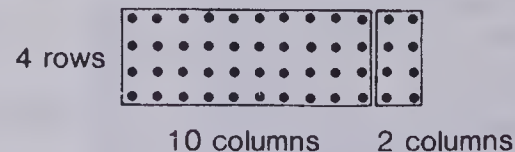


Multiplying and Adding

$4 \times 12 = \blacksquare$ How can we find the missing product?



This array shows 4×12 .



This array also shows 4×12 .

Bob found the missing product this way.

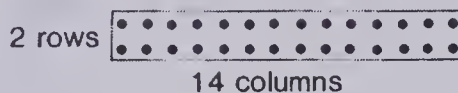
$$\begin{aligned} 4 \times 12 &= (4 \times 10) + (4 \times 2) \\ &= 40 + 8 \\ &= 48 \end{aligned}$$

Exercises

1. Use Bob's method to find the missing products.

$$\begin{aligned} 2 \times 14 &= (2 \times 10) + (2 \times 4) \\ &= 20 + 8 \\ &= 28 \end{aligned}$$

$2 \times 14 = \blacksquare$



2. Write the products.

$3 \times 12 = \blacksquare$ $3 \times 12 = (3 \times 10) + (3 \times 2)$
 $= 30 + 6$
 $= \blacksquare 36$

$4 \times 21 = \blacksquare 84$

(c) $3 \times 32 = \blacksquare 96$

(d) $5 \times 41 = \blacksquare 205$

(e) $7 \times 31 = \blacksquare 217$

(f) $4 \times 32 = \blacksquare 128$

(g) $4 \times 52 = \blacksquare 208$

86 Distributive property (no regrouping)

Using the Book Remind students that they have experience in "breaking apart" numbers. However, since we are dealing with 2-digit numbers, we do not distribute arbitrarily as in this example:

$$7 \times 24 = (7 \times 8) + (7 \times 16)$$

but rather on the basis of place value.

$$7 \times 24 = (7 \times 20) + (7 \times 4)$$

This becomes then, a simple exercise of multiplication by multiples of 10 and multiplication of basic facts.

In groups of two (or two teams), have one person select a card. The other person must write the products as has been practised on this page. In the construction of the cards, be certain that the arrays are always broken down to show a whole number times 10 or a multiple of ten plus a whole number times a whole number, the product of which is less than 10.

Example

$$3 \times 23 \rightarrow (3 \times 20) + (3 \times 3)$$

not

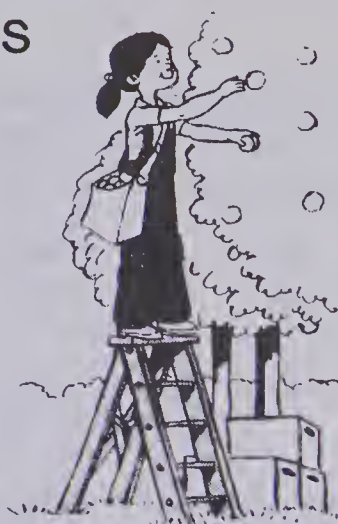
$$(3 \times 15) + (3 \times 8).$$

Picking Peaches

Brenda helps her Uncle pick peaches.
Brenda has picked 3 boxes with 21 peaches in each.
How many peaches altogether?

Step 1	Step 2	Step 3
$\begin{array}{r} 21 \\ \times 3 \\ \hline 3 \end{array}$ <p>(3 × 1)</p>	$\begin{array}{r} 21 \\ \times 3 \\ \hline 3 \end{array}$ <p>60 (3 × 20)</p>	$\begin{array}{r} 21 \\ \times 3 \\ \hline 3 \\ 60 \\ \hline 63 \end{array}$ <p>63 (3 + 60)</p>

Brenda picked 63 peaches.



Exercises

Use Brenda's method to complete each multiplication.

$\begin{array}{r} 32 \\ \times 3 \\ \hline 6 \end{array}$ <p>(3 × 2)</p> <p>90 (3 × 30)</p> <p>96</p>	$\begin{array}{r} 41 \\ \times 3 \\ \hline 3 \end{array}$ <p>(3 × 1)</p> <p>120 (3 × 40)</p> <p>123</p>	$\begin{array}{r} 52 \\ \times 4 \\ \hline 8 \end{array}$ <p>(4 × 2)</p> <p>200 (4 × 50)</p> <p>208</p>
$\begin{array}{r} 42 \\ \times 4 \\ \hline 168 \end{array}$	$\begin{array}{r} 33 \\ \times 2 \\ \hline 66 \end{array}$	$\begin{array}{r} 62 \\ \times 3 \\ \hline 186 \end{array}$
$\begin{array}{r} 53 \\ \times 2 \\ \hline 106 \end{array}$	$\begin{array}{r} 12 \\ \times 4 \\ \hline 48 \end{array}$	$\begin{array}{r} 31 \\ \times 7 \\ \hline 217 \end{array}$
$\begin{array}{r} 43 \\ \times 2 \\ \hline 86 \end{array}$		

Vertical multiplication (no regrouping) 87

Using the Book Use the display to demonstrate the vertical procedure for multiplication, emphasizing that distributing of the 2-digit factor is based on place value. Draw the parallel between this method and the horizontal or expanded form used in the previous lesson.

Before assigning the exercises, encourage students to estimate the products mentally *before* doing any computation. There is a tendency for some children to reverse the order.

Indicate that estimation can help us to judge the reasonableness of our computed answer. Pupils should now begin to see the relationship between the estimated and computed answer.

Example

$$7 \times 21$$

Estimate (done mentally) $7 \times 20 = 140$

"Since I rounded down, my computed answer will be greater."

Calculate $7 \times 21 = 147$

"My answer is reasonable."

It is not intended that students be required to write a multiplication phrase beside each partial product in Exercises 4-11.

OBJECTIVE

To write the product of a 1-digit factor and a 2-digit factor using partial products in a column form (no regrouping)

PACING

Level A All

Level B All

Level C All

RELATED AIDS

BFA COMP LAB II—31.

BFA PROB. SOLVING LAB II—61, 176, 216.

SUGGESTIONS

Initial Activity This lesson provides a more efficient method of multiplication in that the partial products are placed one under another in readiness for addition. Since this method relies on the "distributing" of the 2-digit factor, review this idea with students if you think it necessary (page 86).

Example

$$\begin{aligned} 3 \times 21 &= (3 \times 20) + (3 \times 1) \\ &= 60 + 3 \\ &= 63 \end{aligned}$$

ACTIVITIES

1. See the Fact-Folder idea in the Activity Reservoir. Use factors which require no regrouping.

2. See "Marathon" as described in the Activity Reservoir.

3. See "Picking Peaches" as described in the Activity Reservoir.

EXTRA PRACTICE

(a) $\begin{array}{r} 23 \\ \times 3 \\ \hline \end{array}$	(b) $\begin{array}{r} 51 \\ \times 8 \\ \hline \end{array}$	(c) $\begin{array}{r} 31 \\ \times 6 \\ \hline \end{array}$	(d) $\begin{array}{r} 72 \\ \times 3 \\ \hline \end{array}$
---	---	---	---

(e) $\begin{array}{r} 42 \\ \times 3 \\ \hline \end{array}$	(f) $\begin{array}{r} 13 \\ \times 3 \\ \hline \end{array}$	(g) $\begin{array}{r} 62 \\ \times 4 \\ \hline \end{array}$	(h) $\begin{array}{r} 54 \\ \times 2 \\ \hline \end{array}$
---	---	---	---

OBJECTIVE

To write the product of a 1-digit factor and a 2-digit factor using partial products in a column form (with regrouping)

PACING

Level A All
Level B All
Level C All

RELATED AIDS

BFA COMP LAB II—33.

BACKGROUND

This page extends the "column form" to include a 2-digit number for the first partial product. This provides the basis for regrouping in the short form on page 89.

SUGGESTIONS

Initial Activity Review the steps of vertical multiplication as discussed in the previous lesson. Be sure that the children understand where each number that is written comes from.

Example

$$\begin{array}{r} 43 \\ \times 2 \\ \hline 6 \quad (2 \times 3) \\ 80 \quad (2 \times 40) \\ \hline 86 \quad (6 + 80) \end{array}$$

ACTIVITIES

If you have not already done so, for page 87, see these ideas from the Activity Reservoir.

1. Fact-Folder
2. Marathon
3. Picking Peaches

The Cannery

Bob packs cans of fruit for the Cannery.
Bob packs 7 cartons with 24 cans in each.
How many cans altogether?



Step 1	Step 2	Step 3
$\begin{array}{r} 24 \\ \times 7 \\ \hline 28 \quad (7 \times 4) \end{array}$	$\begin{array}{r} 24 \\ \times 7 \\ \hline 28 \\ 140 \quad (7 \times 20) \end{array}$	$\begin{array}{r} 24 \\ \times 7 \\ \hline 28 \\ 140 \\ \hline 168 \quad (28 + 140) \end{array}$

Bob packed 168 cans altogether.

Exercises

Use Bob's method to complete each multiplication.

$\begin{array}{r} 34 \\ \times 6 \\ \hline 24 \quad (6 \times 4) \\ 180 \quad (6 \times 30) \\ \hline 204 \end{array}$	$\begin{array}{r} 65 \\ \times 7 \\ \hline 35 \quad (7 \times 5) \\ 420 \quad (7 \times 60) \\ \hline 455 \end{array}$	$\begin{array}{r} 42 \\ \times 5 \\ \hline 10 \quad (5 \times 2) \\ 200 \quad (5 \times 40) \\ \hline 210 \end{array}$
4. Estimate first, then multiply.		
$\begin{array}{r} 74 \\ \times 3 \\ \hline 222 \end{array}$	$\begin{array}{r} 67 \\ \times 2 \\ \hline 134 \end{array}$	(c) $\begin{array}{r} 38 \\ \times 4 \\ \hline 154 \end{array}$
(f) $\begin{array}{r} 28 \\ \times 3 \\ \hline 84 \end{array}$	(g) $\begin{array}{r} 85 \\ \times 4 \\ \hline 340 \end{array}$	(h) $\begin{array}{r} 35 \\ \times 9 \\ \hline 315 \end{array}$
		(d) $\begin{array}{r} 63 \\ \times 5 \\ \hline 315 \end{array}$
		(e) $\begin{array}{r} 37 \\ \times 4 \\ \hline 148 \end{array}$
		(i) $\begin{array}{r} 54 \\ \times 4 \\ \hline 216 \end{array}$
		(j) $\begin{array}{r} 92 \\ \times 3 \\ \hline 276 \end{array}$

88 Multiplication: vertical format (with regrouping)

Using the Book Work through the "Cannery" example in the display. Point out that the steps in the multiplication process are the same (i.e., multiply ones, multiply tens, add).

Complete Exercises 1, 4(a) and 4(b) orally with the class before assigning the exercises. Demonstrate that by estimating each product first (4(a) $70 \times 3 = 210$; 4(b) $70 \times 2 = 140$, etc.), we can make sure that our written calculations are reasonable.

A Short Form

This short form saves time.

$$\begin{array}{r} 34 \\ \times 7 \\ \hline ? \end{array}$$

The short form works this way.

Step 1

$$\begin{array}{r} 34 \\ \times 7 \\ \hline 8 \end{array}$$

Write 2 here, meaning 2 tens.
(7 × 4 = 28)
Write 8 and 2.

Step 2

$$\begin{array}{r} 34 \\ \times 7 \\ \hline 238 \end{array}$$

(7 × 3 tens = 21 tens)
Add 2 tens. 2 tens
Write 23. 23 tens.

Exercises

Estimate first, then use the short form to multiply.

1. $\begin{array}{r} 38 \\ \times 6 \\ \hline 228 \end{array}$	2. $\begin{array}{r} 63 \\ \times 4 \\ \hline 252 \end{array}$	3. $\begin{array}{r} 73 \\ \times 5 \\ \hline 365 \end{array}$	4. $\begin{array}{r} 46 \\ \times 3 \\ \hline 138 \end{array}$	5. $\begin{array}{r} 57 \\ \times 5 \\ \hline 285 \end{array}$	6. $\begin{array}{r} 28 \\ \times 4 \\ \hline 112 \end{array}$
7. $\begin{array}{r} 37 \\ \times 6 \\ \hline 222 \end{array}$	8. $\begin{array}{r} 52 \\ \times 8 \\ \hline 416 \end{array}$	9. $\begin{array}{r} 43 \\ \times 7 \\ \hline 301 \end{array}$	10. $\begin{array}{r} 22 \\ \times 9 \\ \hline 198 \end{array}$	11. $\begin{array}{r} 37 \\ \times 4 \\ \hline 148 \end{array}$	12. $\begin{array}{r} 65 \\ \times 6 \\ \hline 390 \end{array}$
13. $\begin{array}{r} 29 \\ \times 3 \\ \hline 87 \end{array}$	14. $\begin{array}{r} 75 \\ \times 2 \\ \hline 150 \end{array}$	15. $\begin{array}{r} 48 \\ \times 3 \\ \hline 144 \end{array}$	16. $\begin{array}{r} 83 \\ \times 4 \\ \hline 332 \end{array}$	17. $\begin{array}{r} 15 \\ \times 9 \\ \hline 135 \end{array}$	18. $\begin{array}{r} 67 \\ \times 5 \\ \hline 335 \end{array}$

Multiplication: short form (with regrouping) 89

Using the Book Now that the children have seen the "long" and "short" form methods of multiplication for the same calculation, use the display to summarize that the short form (a) saves time, (b) requires less written calculation, and (c) yields the same result.

If necessary, complete Exercises 1, 2, and 3 orally with the class. You may wish to suggest that the pre-calculation estimates be completed mentally.

ACTIVITIES

1. Play the game "Quad-Row" as described in the Activity Reservoir.

2. Some students might benefit from using multiplication grids (DM17) to develop and maintain mastery of the basic facts.

Example

×	2	0	8	4	3
1					
6					
2					
3					
5					

Encourage students to develop their own grids and exchange with a classmate.

3. Use "What's My Rule?" to reinforce basic facts. Include factors of 10, 100, and 1000.

Example

(a)	Input	Output
	8	24
	5	15
	2	6
(Rule: × 3)	9	—
	7	—
	1	—
	4	—
(b)	Input	Output
	7	700
	3	300
	16	1600
(Rule: × 100)	8	—
	24	—
	1	—
	15	—

OBJECTIVE

To write the product of a 1-digit factor and a 2-digit factor using the short form of the algorithm (with regrouping)

PACING

Level A 1-15
Level B 1-12
Level C 1-3, 12-18

RELATED AIDS

HMS—DM17 and DM24.
BFA COMP LAB II—34.
BFA PROB. SOLVING LAB II—65.

BACKGROUND

This lesson moves the students from the "column form" to the "short form" algorithm. Ensure that students have a firm understanding of the column method before assigning this page.

SUGGESTIONS

Initial Activity Review the steps of multiplication as presented in the previous lesson by working together through an example such as:

In the library, there is room for 34 books on each shelf.

How many books would there be on 7 shelves?

(a) Estimate $30 \times 7 = 210$. The answer will be a little more than 210 because I rounded down.

$$\begin{array}{r} 34 \\ \times 7 \\ \hline 28 \quad (7 \times 4) \\ 210 \quad (7 \times 30) \\ \hline 238 \quad (28 + 210) \end{array}$$

There would be 238 books on 7 shelves.

Place the example from the display on the chalkboard and demonstrate the procedure for the short form.

Emphasize the importance of the "2" written above the 10's place.

EXTRA PRACTICE

Assign DM24.

OBJECTIVE

To solve mini-stories using both estimated and calculated products

PACING

Level A All
Level B All
Level C All

VOCABULARY

transportation, passengers, conservation park, hauling

RELATED AIDS

HMS—DM19.

SUGGESTIONS

Initial Activity Use an example such as Exercise 1 to review the basic steps of a problem-solving technique (see pages 8, 10-11). Encourage the students to record somewhere in that format an estimate of the product.

Example

1. 23×8

Estimate: $20 \times 8 = 160$

A little more than 160 cartons because I rounded down.

2. Calculate

$$\begin{array}{r} 2 \\ 23 \\ \times 8 \\ \hline 184 \end{array}$$

There are 184 cartons altogether.

ACTIVITIES

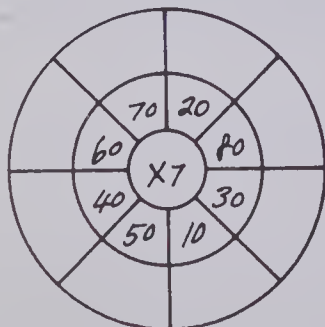
1. Provide students with oral and/or written practice in multiplication with multiples of 10.

Example

6×50 , 3×70 , 8×20 , 4×30

2. You might adapt operation wheels (DM19) to extend this practice with multiples of 10.

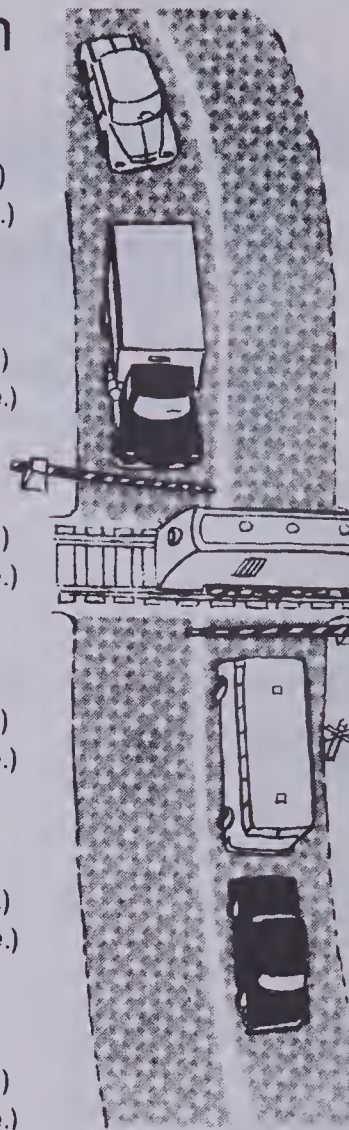
Example



3. Give students the opportunity to create their own problems like the ones on this page. Provide cards (as shown) and have them:
(a) Copy and use their imagination to complete.

Transportation

- 23 trucks.
8 large cartons on each truck.
About how many cartons altogether? 160 (Estimate.)
How many cartons altogether? 184 (Calculate.)
- 28 cars going to the beach.
6 people in each car.
About how many people altogether? 180 (Estimate.)
How many people altogether? 168 (Calculate.)
- 9 cars in a train.
35 passengers in each car.
About how many passengers altogether? 360 (Estimate.)
How many passengers altogether? 315 (Calculate.)
- 5 levels in a parking garage.
48 cars on each level.
About how many cars altogether? 250 (Estimate.)
How many cars altogether? 240 (Calculate.)
- 7 buses going to a conservation park.
39 students on each bus.
About how many students altogether? 280 (Estimate.)
How many students altogether? 273 (Calculate.)
- 16 trucks hauling tractors.
4 tractors on each truck.
About how many tractors altogether? 80 (Estimate.)
How many tractors altogether? 64 (Calculate.)



90 Problem solving — multiplication

Using the Book Before assigning the word problems on this page, be certain that the children are familiar with (a) the problem-solving steps, (b) the vocabulary (see above), and (c) the accepted response format.

(b) Turn the card over and complete the answer key.

(c) Contribute their best to a "Problem Box" for use in the classroom.

Front

47	_____
6	_____
About how many _____ altogether.	
How many _____ altogether.	

Back

Facts
_____ \times _____
Estimate:
_____ \times _____ = _____
A few <u>more</u> than _____
less _____
because I rounded <u>up</u>
down
Calculate:
_____ \times _____
There were _____ altogether.

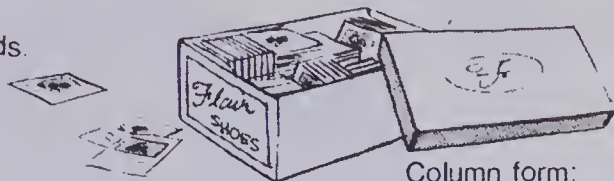
Multiplying Larger Numbers

Robin has 4 boxes of baseball cards.
Each box has 312 cards.
How many cards altogether?

$$312 = 300 + 10 + 2$$

$$\begin{aligned} 4 \times 312 &= (4 \times 300) + (4 \times 10) + (4 \times 2) \\ &= 1200 + 40 + 8 \\ &= 1248 \end{aligned}$$

Robin has 1248 cards.



Column form:

$$\begin{array}{r} 312 \\ \times 4 \\ \hline 8 \quad (4 \times 2) \\ 40 \quad (4 \times 10) \\ 1200 \quad (4 \times 300) \\ \hline 1248 \end{array}$$

Exercises Complete each multiplication.

$$\begin{array}{r} 453 \\ \times 4 \\ \hline 12 \quad (4 \times 3) \\ 200 \quad (4 \times 50) \\ 1600 \quad (4 \times 400) \\ \hline 1812 \end{array}$$

$$\begin{array}{r} 342 \\ \times 6 \\ \hline 12 \quad (6 \times 2) \\ 240 \quad (6 \times 40) \\ 2000 \quad (6 \times 300) \\ \hline 2052 \end{array}$$

$$\begin{array}{r} 327 \\ \times 7 \\ \hline 21 \quad (7 \times 3) \\ 140 \quad (7 \times 20) \\ 2100 \quad (7 \times 300) \\ \hline 2289 \end{array}$$

$$\begin{array}{r} 364 \\ \times 4 \\ \hline 1456 \end{array}$$

$$\begin{array}{r} 522 \\ \times 6 \\ \hline 3132 \end{array}$$

$$\begin{array}{r} 623 \\ \times 4 \\ \hline 2492 \end{array}$$

$$\begin{array}{r} 424 \\ \times 8 \\ \hline 3392 \end{array}$$

$$\begin{array}{r} 218 \\ \times 7 \\ \hline 1526 \end{array}$$

$$\begin{array}{r} 341 \\ \times 5 \\ \hline 1705 \end{array}$$

$$\begin{array}{r} 482 \\ \times 3 \\ \hline 1446 \end{array}$$

$$\begin{array}{r} 652 \\ \times 2 \\ \hline 1304 \end{array}$$

$$\begin{array}{r} 717 \\ \times 4 \\ \hline 2868 \end{array}$$

$$\begin{array}{r} 487 \\ \times 8 \\ \hline 3896 \end{array}$$

Multiplying 3-digit numbers by 1-digit numbers 91

OBJECTIVE

To write the product of a 1-digit factor and a 3-digit factor using the column form

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activity Review, if necessary, the steps involved in the expanded column form of multiplication of a 2-digit whole number by a whole number as presented on page 88.

Using the Book Use the display to demonstrate the expanded and column forms when one of the factors is a 3-digit number. Bring out the point again that we distribute the number by using place value. Most students should be able to calculate the partial products mentally. For those pupils having difficulty, provide further practice in multiplying by multiples of 10 and 100, e.g., 5×30 , 8×600 .

Exercises 1, 2, and 3 include progressively diminishing hints in order to reinforce the calculation pattern as exemplified in the display. You may wish to complete one or all of these on the chalkboard before assigning the exercises. The answers to Exercises 1, 4, and 5 are in the back of the book (page 339).

ACTIVITIES

1. Prepare "Multi-Number Puzzles" (i.e., fill in the blank cards [laminated]) or sheets such as:

$$\begin{array}{r} 522 \\ \times 6 \\ \hline 1\Box \\ \Box\Box0 \\ \Box00\Box \\ \hline 3132 \end{array}$$

$$\begin{array}{r} 424 \\ \times 8 \\ \hline \Box2 \\ 1\Box0 \\ \Box2\Box\Box \\ \hline 33\Box\Box \end{array}$$

2. The children may enjoy constructing their own "Multi-Number Puzzles". Provide 3-digit by 1-digit multiplication questions for the children to complete (see Extra Practice). Have

the children use their corrected computations as a blueprint to making "fill-in-the-blank" braintickers for other class members.

3. Play "Tic Tac Mult". Provide blank samples such as:

$$\begin{array}{r} 342 \\ \times 6 \\ \hline \Box\Box \\ \Box\Box\Box \\ \Box\Box\Box\Box \\ \hline \Box\Box\Box\Box \end{array}$$

Players (2) take turns using 2 different coloured pencils to place a number in its correct place. Winner is the first to enter three numbers in a row horizontally, vertically, or diagonally.

EXTRA PRACTICE

$$\begin{array}{r} 1. \quad 341 \\ \times 5 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 482 \\ \times 3 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 652 \\ \times 2 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 717 \\ \times 4 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 487 \\ \times 3 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 674 \\ \times 5 \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 236 \\ \times 6 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 879 \\ \times 2 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 925 \\ \times 3 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 519 \\ \times 4 \\ \hline \end{array}$$

OBJECTIVE

To round numbers less than 1000 to the nearest 100

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activity Review orally, counting by 100's from any starting position.

Example

(a) 400 → 500, 600, 700, etc.

(b) 200 → 300, 400, 500, etc.

Display on the chalkboard a series such as:

200, 300, _____, 500, _____, 700, _____.

Have children fill in the blanks.

ACTIVITIES

1. The activities suggested on page 81 can easily be adapted to rounding to the nearest multiple of 100.

2. Provide a Secret Code Activity such as:

Round each number to the nearest multiple of 100. Use the answer and the Secret Code to solve the Mystery Riddle.

Mystery Riddle

What do cowboys, bowling-ball makers, and Math Experts all have in common?

Answer: They are

A	L	L
320 →	688 →	742 →

G	O	O	D
833 →	62 →	112 →	960 →

A	T
251 →	636 →

R	O	U	N
199 →	146 →	941 →	436 →

D	I	N	G
993 →	502 →	360 →	757 →

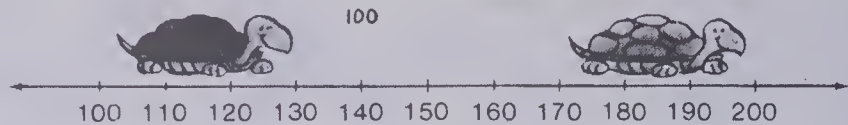
Secret Code

800 — G	700 — L
200 — R	100 — O
500 — I	600 — T
300 — A	900 — U
400 — N	1000 — D

Rounding Numbers

Is Redback closer to 100 or 200?

Is Blueback closer to 100 or 200?



Exercises

1. Which of the red numbers are closer to 200 than 300? 210, 220, 230, 240. Which are closer to 300? 260, 270, 280, 290



2. Round each red number to the nearest multiple of 100.



410 → 400 430 → ■ 400 460 → ■ 500 480 → ■ 500
420 → ■ 400 440 → ■ 400 470 → ■ 500 490 → ■ 500

3. Is 350 closer to 300 or 400? 350 is halfway between 300 and 400



A number halfway between two multiples of 100

is rounded to the greater multiple of 100.

4. Round each number to the nearest multiple of 100.

● 465 500 ● 208 200 ● 150 100 (d) 719 700 (e) 367 400 (f) 255 300
(g) 840 800 (h) 110 100 (i) 689 700 (j) 888 900 (k) 450 500 (l) 506 500

92 Rounding numbers to the nearest hundred

Using the Book This page extends the ideas covered on page 81 (rounding to nearest 10). Use the display to develop the idea of proximity of a number to a multiple of 100. Be certain children are familiar with the rules of rounding by asking, "What if Redback was standing on 130, or 140? Would he be closer to 100 or 200?"

Emphasize that a half-way number like 350, as in Exercise 3, is rounded to the greater multiple of 100. As on page 81, discourage the use of equal signs (i.e., 400 = 400). Rather, use an arrow or appropriate symbol (i.e., 440 → 400; or 440 ≈ 400).

Discuss what happens when you round numbers less than 100 (those between 50 and 99 round to 100; those 49 and less round to 0). Ask the students to round these to the nearest multiple of 100: 89, 37, 4, 96, 51, 42, 18, 52.

In the Ball Park

Let's estimate!

$$3 \times 267$$

Is your product in the ball park?

1. Round Down.
 $3 \times 200 = 600$

2. Round Up.
 $3 \times 300 = 900$

3. My answer is between 600 and 900.
 $3 \times 267 = 801$

Rounding can be done mentally!

Estimates tell us if our written answers are reasonable!

Exercises

Round down and up *mentally*, then calculate the product.

Is your product in the ball park?

1. Round down.
600

$$\begin{array}{r} 2 \times 346 \\ \hline 692 \end{array}$$

Round up.
800

2. Round down.
800

$$\begin{array}{r} 4 \times 235 \\ \hline 940 \end{array}$$

Round up.
1200

$$\begin{array}{r} 416 \\ \times 5 \\ \hline 2080 \end{array}$$

$$\begin{array}{r} 212 \\ \times 3 \\ \hline 636 \end{array}$$

$$\begin{array}{r} 675 \\ \times 2 \\ \hline 1350 \end{array}$$

$$\begin{array}{r} 520 \\ \times 4 \\ \hline 2080 \end{array}$$

$$\begin{array}{r} 382 \\ \times 3 \\ \hline 1146 \end{array}$$

$$\begin{array}{r} 315 \\ \times 7 \\ \hline 2205 \end{array}$$

$$\begin{array}{r} 781 \\ \times 4 \\ \hline 3124 \end{array}$$

$$\begin{array}{r} 623 \\ \times 3 \\ \hline 1869 \end{array}$$

$$\begin{array}{r} 580 \\ \times 2 \\ \hline 1160 \end{array}$$

$$\begin{array}{r} 168 \\ \times 4 \\ \hline 672 \end{array}$$

$$\begin{array}{r} 612 \\ \times 5 \\ \hline 3060 \end{array}$$

$$\begin{array}{r} 829 \\ \times 7 \\ \hline 5803 \end{array}$$

Estimating larger products 93

OBJECTIVE

To estimate the product of a 1-digit factor and a 3-digit factor

PACING

Level A All
Level B All
Level C All

VOCABULARY

mentally

RELATED AIDS

HMS—DM25.

BACKGROUND

As the size of factors increases, it becomes more difficult to tell whether the calculated product is reasonable in relation to the estimated product. One solution is to provide limits within which the calculated product must fall.

SUGGESTIONS

Initial Activity Provide students with a chalkboard exercise similar to this:

Number	Round Up	Round Down
473	500	400
312	400	300
687	700	600
543		
216		

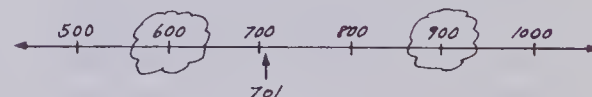
Use the diagram in the display to describe what is meant by "in the ball park". You might use an improvised "number line" on the chalkboard to demonstrate that the calculated product will fall somewhere between the two estimated limits.

Example

$$3 \times 267 = 801$$

$$3 \times 200 = 600$$

$$3 \times 300 = 900$$



Example

$580 \times 2 = 1160$. Yes, it's in the ball park.

To score, each player uses his/her correct product, i.e., 1st player scores 1160, 2nd scores 1000, 3rd scores 1200. Player with the highest (or lowest) score after 3 complete rotations is the winner.

3. See the Fact-Folder idea in the Activity Reservoir.

ACTIVITIES

1. See DM25.

2. Play "Ball Park". Provide a sufficient number of cards as shown.

$$\begin{array}{r} 580 \\ \times 2 \\ \hline \end{array}$$

Divide group into 3's. First player takes

a card and shows it to the other 2 players.

Second player "rounds down" and tells that product, i.e., $500 \times 2 = 1000$.

Third player "rounds up" and tells that product, i.e., $600 \times 2 = 1200$.

First player performs the calculation and all three check to see if it's "in the ballpark".

OBJECTIVE

To write the product of a 1-digit factor and a 3-digit factor using the short form of the algorithm

PACING

Level A All

Level B All

Level C All

BACKGROUND

The display develops two multiplication types (e.g., no regrouping and partial regrouping).

Page 95 will develop a third type (with regrouping).

SUGGESTIONS

Initial Activity Many of the children may benefit from a review of the short form of multiplication as it was presented on page 89.

Example

	1
83	books of raffle tickets.
4	tickets in each book.
<u>32</u>	
332	How many tickets altogether?

ACTIVITIES

1. To provide some practice with adding the "helper number" you might provide oral drill as suggested below.

Example

$3 \times 9 + 5 = \underline{\quad}$, $6 \times 8 + 3 = \underline{\quad}$,
 $7 \times 8 + 5 = \underline{\quad}$, $4 \times 7 + 1 = \underline{\quad}$.

2. See "Deal a Number Sentence" as described in the Activity Reservoir.

3. Play "I'll Be There". Prepare: a deck of cards as shown, half of which are inked in red, half in green; a number cube marked 0-5.

421

612

382

214

Players take turns selecting a card from the shuffled, face-down deck; displaying it; and rolling the die. They must then perform the calculation. If the card had green numerals, they start or add to their personal totals. If the card was red, they subtract the product.

Player with the highest score after 4 turns is the winner. (A calculator might be helpful to check, add totals.)

The Short Form

Let's use the short-form method.

$$3 \times 312 = \blacksquare$$

Step 1

$$\begin{array}{r} 312 \\ \times 3 \\ \hline 6 \end{array}$$

6 Write 6.

Step 2

$$\begin{array}{r} 312 \\ \times 3 \\ \hline 36 \end{array}$$

36 Write 3.

Step 3

$$\begin{array}{r} 312 \\ \times 3 \\ \hline 936 \end{array}$$

936 Write 9.

$$6 \times 321 = \blacksquare$$

Step 1

$$\begin{array}{r} 321 \\ \times 6 \\ \hline 6 \end{array}$$

6 Write 6

Step 2

$$\begin{array}{r} 321 \\ \times 6 \\ \hline 26 \end{array}$$

26 Write 2.

Step 3

$$\begin{array}{r} 321 \\ \times 6 \\ \hline 1926 \end{array}$$

Add 1 hundred

Regroup 1 hundred.

Write 19

19 hundreds

Exercises Copy and complete each multiplication.

$$\begin{array}{r} 324 \\ \times 2 \\ \hline \end{array}$$

$$\begin{array}{r} 231 \\ \times 3 \\ \hline \end{array}$$

$$\begin{array}{r} 463 \\ \times 3 \\ \hline \end{array}$$

$$\begin{array}{r} 341 \\ \times 4 \\ \hline \end{array}$$

$$\begin{array}{r} 48 \\ \times 6 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ \times 69 \\ \hline \end{array}$$

$$\begin{array}{r} 89 \\ \times 13 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \\ \times 136 \\ \hline \end{array}$$

Multiply. Use the short form.

$$\begin{array}{r} 214 \\ \times 2 \\ \hline \end{array}$$

$$\begin{array}{r} 113 \\ \times 3 \\ \hline \end{array}$$

$$\begin{array}{r} 322 \\ \times 3 \\ \hline \end{array}$$

$$\begin{array}{r} 142 \\ \times 2 \\ \hline \end{array}$$

$$\begin{array}{r} 241 \\ \times 6 \\ \hline \end{array}$$

$$\begin{array}{r} 472 \\ \times 3 \\ \hline \end{array}$$

$$428$$

$$339$$

$$966$$

$$284$$

$$1446$$

$$1416$$

$$11. 351$$

$$12. 362$$

$$13. 612$$

$$14. 523$$

$$15. 421$$

$$16. 382$$

$$\times 5$$

$$\times 4$$

$$\times 3$$

$$\times 3$$

$$\times 6$$

$$\times 3$$

$$1755$$

$$1448$$

$$1836$$

$$1569$$

$$2526$$

$$1146$$

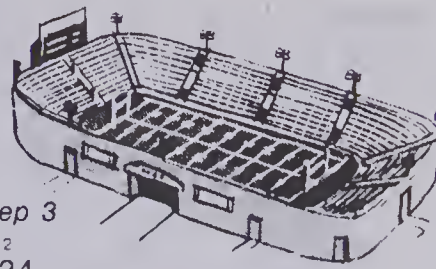
94 Short form of multiplication (no regrouping and partial regrouping)

Using the Book Use the examples in the display to demonstrate the shorter form. Note that the second example uses a "helper number" to indicate regrouping. Students will be familiar with this form from work done on page 89.

Exercises 1, 2, 5-8, 13, and 14 provide practice with the first example; Exercises 3, 4, 9-12, 15, and 16 provide practice with the second example.

Extending the Short Form

There are 6 sections in the Bradville Stadium.
Each section has 324 seats.
How many seats altogether?



Let's use the short-form method.

Step 1	Step 2	Step 3
$\begin{array}{r} 324 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 324 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 324 \\ \times 6 \\ \hline \end{array}$
$6 \times 4 = 24$ 4 Write 4. Regroup 2 tens.	$6 \times 2 \text{ tens} = 12 \text{ tens}$ 44 Add Write 4. Regroup 1 hundred.	$6 \times 3 \text{ hundreds} = 18 \text{ hundreds}$ 2 tens 1944 Add Write 19.
		19 hundreds

Exercises Copy and complete each multiplication.

$\begin{array}{r} 346 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 423 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 352 \\ \times 6 \\ \hline \end{array}$			
$\begin{array}{r} 254 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 263 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 353 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 283 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 132 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 367 \\ \times 4 \\ \hline \end{array}$
10. $\begin{array}{r} 544 \\ \times 3 \\ \hline \end{array}$	11. $\begin{array}{r} 232 \\ \times 8 \\ \hline \end{array}$	12. $\begin{array}{r} 435 \\ \times 4 \\ \hline \end{array}$	13. $\begin{array}{r} 675 \\ \times 2 \\ \hline \end{array}$	14. $\begin{array}{r} 243 \\ \times 7 \\ \hline \end{array}$	15. $\begin{array}{r} 566 \\ \times 2 \\ \hline \end{array}$
16. $\begin{array}{r} \$3.84 \\ \times 4 \\ \hline \end{array}$	17. $\begin{array}{r} \$2.42 \\ \times 6 \\ \hline \end{array}$	18. $\begin{array}{r} \$4.36 \\ \times 5 \\ \hline \end{array}$	19. $\begin{array}{r} \$3.23 \\ \times 7 \\ \hline \end{array}$	20. $\begin{array}{r} \$1.49 \\ \times 6 \\ \hline \end{array}$	21. $\begin{array}{r} \$3.78 \\ \times 5 \\ \hline \end{array}$
$\$15.36$	$\$14.52$	$\$21.80$	$\$22.61$	$\$8.94$	$\$18.90$

Short form of multiplication (with regrouping) 95

Using the Book Use the display to demonstrate the procedure for multiplication with regrouping. Ask students to describe each step.

As you have done with other algorithms, encourage students, when they are ready, to omit the "helper numbers" and regroup mentally. Exercises 16-21 involve money. You may wish to remind students that (a) multiplying money is just like multiplying whole numbers and (b) the product requires a decimal point and a \$ sign.

OBJECTIVE

To write the product of a 1-digit factor and a 3-digit factor using the short form of the algorithm (with regrouping)

PACING

Level A 1-15, 19-21
Level B 1-11, 16-19
Level C 1-9, 18-21

RELATED AIDS

HMS—DM26.

ACTIVITIES

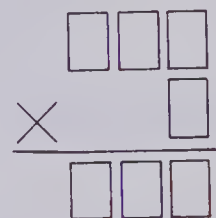
1. You might use the "Birthday Trick" to provide practice with other operations as well as multiplication. (This trick might even be an interesting way to introduce the lesson.) For example, ask students: "(a) Write down the number which represents the month of your birthday (i.e., January = 1, February = 2, March = 3, etc.); (b) Multiply by 5; (c) Add 6; (d) Multiply by 4; (e) Add 9; (f) Multiply by 5; (g) Add the day of your birthday; (h) Subtract 165; (i) Give me your final answer and I'll tell you the month and day of your birthday!"

Example

823

August 23rd

3. Put this challenge on the chalkboard for some students.



"Use only odd numbers for the digits in the factors so that the digits of the product are odd numbers too!"
Some possible solutions:

$\begin{array}{r} 511 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 533 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 199 \\ \times 9 \\ \hline \end{array}$
1533	1599	1791

3. See "Marathon" as described in the Activity Reservoir.

EXTRA PRACTICE

See DM26.

OBJECTIVE

To review and practise multiplication skills presented in this chapter

PACING


Level A All
Level B All
Level C All

RELATED AIDS

HMS — DM24 and DM26.

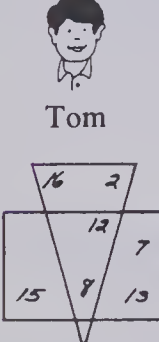
ACTIVITY

Prepare a set of Intersection Cards.



Ring in red each number in the circle.
Ring in green each number in the triangle.
Ring in black each number less than 6.
My number is ringed three times.

Rosy's number



Ring in blue each number in the rectangle.
Ring in brown each number in the triangle.
Ring in black each number less than 9.
My number is ringed three times.

Tom's number

EXTRA PRACTICE

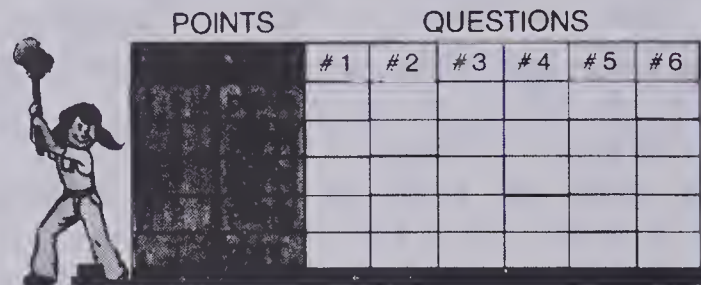
See DM26.

Practice

Multiply.

1. (a) 3×10^{30} (b) 15×100^{1500} (c) 1000×6^{6000} (d) 53×1^{53} (e) 126×10^{1260}
2. (a) $\begin{array}{r} 23 \\ \times 3 \\ \hline \end{array}$ (b) $\begin{array}{r} 14 \\ \times 2 \\ \hline \end{array}$ (c) $\begin{array}{r} 32 \\ \times 3 \\ \hline \end{array}$ (d) $\begin{array}{r} 21 \\ \times 4 \\ \hline \end{array}$ (e) $\begin{array}{r} 43 \\ \times 3 \\ \hline \end{array}$
3. (a) $\begin{array}{r} 56 \\ \times 3 \\ \hline \end{array}$ (b) $\begin{array}{r} 47 \\ \times 4 \\ \hline \end{array}$ (c) $\begin{array}{r} 28 \\ \times 5 \\ \hline \end{array}$ (d) $\begin{array}{r} 34 \\ \times 6 \\ \hline \end{array}$ (e) $\begin{array}{r} 44 \\ \times 7 \\ \hline \end{array}$
4. (a) $\begin{array}{r} 213 \\ \times 3 \\ \hline \end{array}$ (b) $\begin{array}{r} 124 \\ \times 2 \\ \hline \end{array}$ (c) $\begin{array}{r} 312 \\ \times 2 \\ \hline \end{array}$ (d) $\begin{array}{r} 232 \\ \times 2 \\ \hline \end{array}$ (e) $\begin{array}{r} 132 \\ \times 3 \\ \hline \end{array}$
5. (a) $\begin{array}{r} \$3.61 \\ \times 2 \\ \hline \end{array}$ (b) $\begin{array}{r} \$2.42 \\ \times 4 \\ \hline \end{array}$ (c) $\begin{array}{r} \$4.52 \\ \times 3 \\ \hline \end{array}$ (d) $\begin{array}{r} \$2.31 \\ \times 6 \\ \hline \end{array}$ (e) $\begin{array}{r} \$2.83 \\ \times 3 \\ \hline \end{array}$
6. (a) $\begin{array}{r} 347 \\ \times 3 \\ \hline \end{array}$ (b) $\begin{array}{r} 265 \\ \times 5 \\ \hline \end{array}$ (c) $\begin{array}{r} 453 \\ \times 6 \\ \hline \end{array}$ (d) $\begin{array}{r} 324 \\ \times 7 \\ \hline \end{array}$ (e) $\begin{array}{r} 543 \\ \times 4 \\ \hline \end{array}$

Each correct answer is worth 1 point. Graph your results.



96 Multiplication practice (short forms)

Using the Book If you intend to assign the whole page, assign it at various times. You may wish to assign only certain exercises to particular students who require extra practice in those skills. The chart below provides a skill outline and the related chapter pages.

Exercise	Skills	Page Reference
1	Multiplication by 1, 10, 100	79-80
2	2-digit by 1-digit, no regrouping	87
3	2-digit by 1-digit, with regrouping	89
4	3-digit by 1-digit, no regrouping	94
5	3-digit by 1-digit, partial regrouping	94
6	3-digit by 1-digit, with regrouping	95

The completed graph, as shown at the bottom of the pupil page, will provide you and the students with a profile of overall achievement. Also, each shaded bar can be used to evaluate mastery of a particular skill. A score of 4 out of 5 or better (80%) strongly suggests that the skill has been mastered. A score of 3 out of 5 or less may point to a need for some remedial work. Emphasize that the children should draw the graph and shade in the appropriate bars. Stress that they should not attempt to mark directly in the text.

Sports Shop Owner

Arvin Sports Factory Catalogue		Footballs	— 28 per box
Tennis balls	— 25 per box	Basketballs	— 47 per box
Soccer balls	— 36 per box	Softballs	— 54 per box
Golf balls	— 82 per box	Volleyballs	— 65 per box
Beach balls	— 75 per box	All products guaranteed	

The Findlays run a sports shop. Help them prepare an order.
Find out how many balls there are of each kind.

Please order:	Total
5 boxes of footballs.	140
4 boxes of soccer balls.	144
8 boxes of softballs.	432
2 boxes of basketballs.	94
9 boxes of tennis balls.	225
6 boxes of volleyballs.	390
3 boxes of beach balls.	225
7 boxes of golf balls.	574



What is the greatest number of balls ordered? 574
What is the smallest number of balls ordered? 94
Find the difference. 480

Problem solving 97

Using the Book In order to make this exercise more realistic, you might prepare a duplicated order form or have students construct their own. Be certain that the children recognize the vocabulary (see above) and understand what to do.

Example

Description	Quantity	Computation
Footballs:	$5 \times 28 = 140$	$\begin{array}{r} 28 \\ \times 5 \\ \hline 140 \end{array}$
Soccer balls:	$4 \times 36 = 144$	$\begin{array}{r} 36 \\ \times 4 \\ \hline 144 \end{array}$

OBJECTIVE

To select appropriate data from a chart to solve simple problems

PACING

Level A All
Level B All
Level C All

VOCABULARY

tennis balls, basketballs, volleyballs, guaranteed

SUGGESTIONS

Initial Activity Refer to the Career Awareness in the Chapter Overview, page 60. You may wish to use the description of a sports shop owner as a basis for discussion with the class.

ACTIVITIES

1. Provide extra practice in multiplication as well as number comparison by using questions similar to these:
"Use $<$, $>$, or $=$."

(a) $3 \times 24 \cdot 4 \times 17$ (b) $4 \times 35 \cdot 2 \times 60$
(c) $5 \times 73 \cdot 7 \times 53$ (d) $4 \times 100 \cdot 40 \times 10$

2. Some children might enjoy working on this challenge. "Tom and Susan played "Tic-Tac-Toe" on this grid. Tom won the game using four X's. He multiplied the numbers under his X's and got 240. Where were his four X's?"

X	7	6
4	X	X
9	6	X

$$3 \times 8 \times 2 \times 5 = 240$$

3. Have the students draw or collect pictures which illustrate their favourite sport.

OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS—DM27.

Chapter Test

1. Round to the nearest 10.
(a) 24 20 (b) 85 90 (c) 137 140 (d) 53 50 (e) 67 70 (f) 31 30 (g) 189 190
2. Round to the nearest 100.
(a) 643 600 (b) 875 900 (c) 291 300 (d) 545 500 (e) 250 300 (f) 767 800 (g) 477 500
3. Estimate, and then calculate.
(a) $\begin{array}{r} 23 \\ \times 6 \\ \hline 138 \end{array}$ (b) $\begin{array}{r} 35 \\ \times 7 \\ \hline 245 \end{array}$ (c) $\begin{array}{r} 342 \\ \times 5 \\ \hline 1710 \end{array}$ (d) $\begin{array}{r} 89 \\ \times 9 \\ \hline 801 \end{array}$ (e) $\begin{array}{r} 111 \\ \times 4 \\ \hline 444 \end{array}$
4. Multiply.
(a) 7×10 70 (b) 9×100 900 (c) 14×1000 14,000 (d) 10×10 100 (e) 140×1 140
(f) 35×1000 35,000 (g) 26×10 260 (h) 138×1 138 (i) 100×75 7500 (j) 7×100 700
5. Multiply.
(a) $\begin{array}{r} 21 \\ \times 4 \\ \hline 84 \end{array}$ (b) $\begin{array}{r} 62 \\ \times 3 \\ \hline 186 \end{array}$ (c) $\begin{array}{r} 50 \\ \times 7 \\ \hline 350 \end{array}$ (d) $\begin{array}{r} 43 \\ \times 6 \\ \hline 258 \end{array}$ (e) $\begin{array}{r} 47 \\ \times 9 \\ \hline 423 \end{array}$
(f) $\begin{array}{r} 214 \\ \times 2 \\ \hline 428 \end{array}$ (g) $\begin{array}{r} 210 \\ \times 7 \\ \hline 1470 \end{array}$ (h) $\begin{array}{r} 421 \\ \times 6 \\ \hline 2526 \end{array}$ (i) $\begin{array}{r} 564 \\ \times 4 \\ \hline 2256 \end{array}$ (j) $\begin{array}{r} 107 \\ \times 8 \\ \hline 856 \end{array}$
(k) $\begin{array}{r} 143 \\ \times 4 \\ \hline 572 \end{array}$ (l) $\begin{array}{r} 377 \\ \times 5 \\ \hline 1885 \end{array}$ (m) $\begin{array}{r} 282 \\ \times 3 \\ \hline 846 \end{array}$ (n) $\begin{array}{r} 447 \\ \times 6 \\ \hline 2682 \end{array}$ (o) $\begin{array}{r} 601 \\ \times 8 \\ \hline 4808 \end{array}$
6. An office building has 7 floors. Each floor has 24 telephones. How many telephones altogether? 168
7. An apartment building has 9 floors. There are 132 lights on each floor. How many lights altogether? 1188

Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 60).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
All	A	69, 76, 78
1, 2	C	81, 92
3	D	84, 93
4	B	79, 80
5	E	87-95
6, 7	F	90, 97

Cumulative Review

- Write numbers for these.
 - 8 thousands, 5 hundreds, 0 tens, 2 ones 8502
 - five thousand, nine hundred seventy 5970
- Give the meaning of the 6 in each number
 - 5627 6 hundreds
 - 64 250 6 ten thousands
 - 52 836 6 ones
 - 4765 6 tens
 - 65 6 tens
- Compare. Use $<$, $>$, or $=$.
 - $46 \bullet 62 <$
 - $509 \bullet 429 >$
 - $6397 \bullet 6529 <$
 - $227 \bullet 227 =$
 - $57 \bullet 91 <$
 - $112 \bullet 112 =$
 - $7655 \bullet 7654 >$
 - $783 \bullet 780 >$
- Make these number sentences true.
 - $7 + \square = 12$ 5
 - $15 - \square = 7$ 8
 - $\square + 6 = 17$ 11
 - $17 - \square = 8$ 9
- Add.
 - $$\begin{array}{r} 6458 \\ + 3379 \\ \hline 9837 \end{array}$$
 - $$\begin{array}{r} 1627 \\ 485 \\ + 3062 \\ \hline 5174 \end{array}$$
- Subtract.
 - $$\begin{array}{r} 403 \\ - 125 \\ \hline 278 \end{array}$$
 - $$\begin{array}{r} 4261 \\ - 2587 \\ \hline 1674 \end{array}$$
- Multiply.
 - $$\begin{array}{r} 412 \\ \times 3 \\ \hline 1236 \end{array}$$
 - $$\begin{array}{r} 534 \\ \times 6 \\ \hline 3204 \end{array}$$
 - $$\begin{array}{r} 431 \\ \times 2 \\ \hline 862 \end{array}$$
 - $$\begin{array}{r} 762 \\ \times 4 \\ \hline 3048 \end{array}$$
 - $$\begin{array}{r} 592 \\ \times 7 \\ \hline 4144 \end{array}$$
- Which is longer?
 - 250 cm or 2 m 250 cm
 - 2 cm or 30 mm 30 mm
- Draw a line 2 dm long.
 - How long is it in centimetres? 20 cm
 - How long is it in millimetres? 200 mm
- About how long is a dollar bill? 15 mm, 15 cm, or 15 dm? 15 cm
- Pam drove 145 km, and then another 87 km.
How many kilometres altogether? 232 km

OBJECTIVE

To review and test selected concepts and skills previously covered

PACING

Level A All
Level B All
Level C All

Using the Book This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1	33
2	39
3	36
4	9
5(a)	38
5(b)	41
6(a)	28
6(b)	42
7	95
8, 9, 10	50
11	51

CHAPTER 4 OVERVIEW

This chapter develops the relationship between division and multiplication. This relationship is used to present and reinforce the basic division facts. A number of intermediate steps are used to develop the standard division algorithm.

OBJECTIVES

- A To show the relationship between division and multiplication
- B To divide using the standard division algorithm with and without remainders
- C To solve word problems

BACKGROUND

When speaking of division, there are two concepts frequently referred to: the Measurement Concept and the Partitive Concept of division. Students should begin to develop understanding of both of these; division can otherwise become a meaningless and often difficult manipulation of numbers, particularly with regard to problem solving.

In the *Measurement Concept*, the student is asked to find the number of equivalent sets or groups of a given size contained in a larger set. The number of objects in a set is known.

Example

24 pencils altogether. (Total number)
6 pencils in each package. (Number of objects in each set)

How many packages? (How many sets?)

In the *Partitive Concept*, the student is asked to find the number of objects in each set. The number of sets is known.

Example

24 pencils altogether. (Total number)
4 packages. (Number of sets)
How many *pencils* in each package? (How many objects in each set?)

In most cases, pupils can correctly solve a division problem — that is, finding the missing quotient. The difficulties arise when they attempt to correctly interpret the results, calling the answer “pencils” instead of “packages”, and vice versa. This difficulty is compounded where remainders occur. The decision has to be made as to whether the remainder is appropriate or not.

Where remainders occur in a problem-solving situation, the problem should be structured to include the question “How many left over?” This is particularly important with “Partitive” problems. Problems should wherever possible contain items that are “discrete” units (i.e., under reasonable circumstances the units should not be subdivided).

Example

23 doughnuts.
Five bags to be filled equally.
How many doughnuts in each bag?

$$\begin{array}{r} 4 \text{ R } 3 \\ 5 \overline{) 23} \end{array}$$

Answer #1: $4\frac{3}{5}$ (or 4.6) doughnuts per bag.

Answer #2: 4 doughnuts per bag with 3 left over. (While #1 is mathematically possible, #2 is the reasonable choice for a Grade 4 student.)

The idea of division as finding the number of equivalent sets of a given size or the number of elements in a given set corresponds to multiplication.

In the open number sentence $\blacksquare \times 6 = 18$ (“How many sets of 6 in 18?”), we can identify the number of elements in each set, but not the number of sets. In the related division sentence we try to identify the number of sets of 6 in 18 (measurement).

Example

$$\blacksquare \times 6 = 18 \qquad 18 \div 6 = 3 \qquad 3 \times 6 = 18$$

Likewise, in the open number sentence $3 \times \blacksquare = 18$ (“How many elements in each of 3 equivalent sets in 18?”), we can identify the number of sets, but not the number of elements in each set. As above, we can use a related division sentence.

Example

$$3 \times \blacksquare = 18 \qquad 18 \div 3 = 6 \qquad 6 \times 3 = 18$$

Corresponding multiplication and division sentences then, are inverse statements.

With regard to the consistency of approach in numerically representing “3 groups of 6” as “ $3 \times 6 = 18$ ”, specifically as applied to pages 102 and 103, please see the Background comments in the Chapter Overview for Chapter 3 (page 60).

MATERIALS

counters

CAREER AWARENESS

Grocery Store Clerk [111]

A grocery store clerk must have a wide knowledge of the products carried by the store and where they are on the shelves. For example, a clerk is often asked questions such as, “Where can I find the cornstarch?” or “Is this the only brand of canned peaches that you have?”

A clerk is responsible for properly pricing the goods and for stocking the shelves. The stock must be carefully rotated so that products are not left forgotten at the back of the shelf. This is particularly important with dairy and meat products which are often stamped with a “Good Until” date. Clerks try to ensure that a product is sold before the expiry date.

A clerk endeavours to make the product displays as appealing as possible. Vegetables are often lightly sprayed with water to give them that “just picked” look. Meat counters have to be clean and bright, and must be frequently tidied up after customers search for the most suitable cut of meat.

Students are often hired part time to help stock shelves and to help pack customers’ groceries during busy shopping periods.

Clerks must be helpful, pleasant, and courteous to customers. This helps to build a positive image for the store and makes shopping a more pleasant experience.

Division

Tom has 20 stamps.
He wants to put them in groups of 5
How many groups?

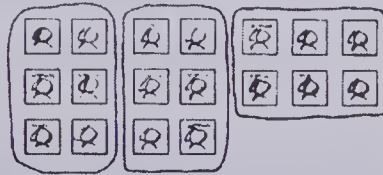


How many groups of 5 in 20? 4 $20 \div 5 = 4$ $5 \overline{)20}$

Exercises

- Draw 18 stamps on a piece of paper.
Circle groups of 6.
How many groups of 6 in 18? 3

$$18 \div 6 = 3 \quad 6 \overline{)18}$$



2. Draw 12 stamps.
Circle groups of 3.
How many groups of 3 in 12? 4

$$12 \div 3 = 4 \quad 3 \overline{)12}$$

3. Draw 24 stamps.
Circle groups of 6.
How many groups of 6 in 24? 4

$$24 \div 6 = 4 \quad 6 \overline{)24}$$

Write a division sentence for each. Find each answer.

- How many groups of 7 in 21? $21 \div 7 = 3$

6. How many groups of 4 in 12? $12 \div 4 = 3$

8. How many groups of 5 in 25? $25 \div 5 = 5$

5. How many groups of 3 in 18? $18 \div 3 = 6$

7. How many groups of 2 in 10? $10 \div 2 = 5$

9. How many groups of 6 in 30? $30 \div 6 = 5$

Meaning of division 101

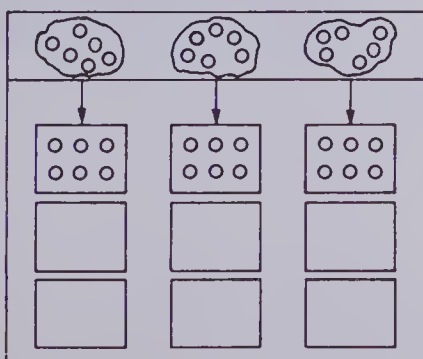
Using the Book Relate the example in the display to the experiences with counters, reinforcing again the idea of equivalent sets.

Some students might find it helpful to draw arrays for Exercises 4-9 before attempting the related division sentence.

ACTIVITIES

1. Provide students with a "Division Mat", counters, and questions similar to Exercises 4-9.

Example



"How many groups of 6 in 18?"
Students place the required number of counters (18) at the top of the mat then proceed to subdivide by placing groups of six in the boxes.

The Division Mat shows quite nicely that there are 3 groups of 6 in 18 or $18 \div 6 = 3$. (This provides concrete practice with the Measurement aspect of division — i.e., where we are asked to find the number of sets.)

2. The Division Mat can also be used to demonstrate the Partitive aspect of division — i.e., where we are asked to find the number of elements in each set. The procedure works most effectively using the idea of "Fair Shares".

OBJECTIVE

To find the number of equivalent sets of a given size by writing a division sentence

PACING

Level A All
Level B All
Level C All

MATERIALS

counters

RELATED AIDS

HMS—DM28.
CALC. W/BK — 7.

SUGGESTIONS

Initial Activity Provide students with counters. Give students the time to experience numerous examples similar to the one in the display.

Example

"Make a pile of 15 counters. Find out how many groups of 5 there are in 15."

As you progress with each example, keep a chalkboard record using both the open number sentence form and the algorithm form.

Example $15 \div 5 = 3$ $5 \overline{)15}$

Encourage students to relate both forms to the question, "How many groups of 5 in 15?"

Fill in the missing quotients based on the results of the grouping of the counters.

Example $15 \div 5 = 3$ $5 \overline{)15}$

Emphasize the point that each group contains the same number of counters — that is, the groups or sets are equivalent. Encourage students to provide a suitable oral response to the initial question, e.g., "How many groups of 5 in 15?" "There are 3 groups of 5 in 15."

Example

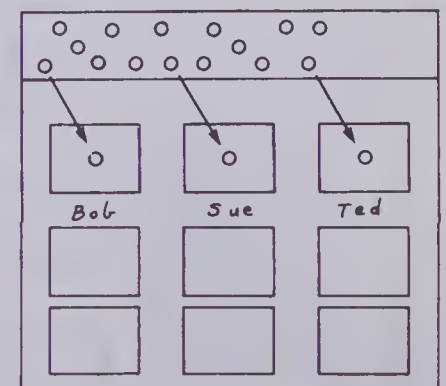


Figure 1

(Continued on page 104)

OBJECTIVE

To write the missing quotient in a division sentence by identifying a missing factor in a related multiplication sentence

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

quotient

MATERIALS

student counters, graph paper

SUGGESTIONS

Initial Activity Use counters or graph paper to set up arrays. Establish a multiplication sentence for each one, then develop the related division sentence (inverse statement). Bring out the point that the completed division sentence answers the question “How many groups?”, e.g., $21 \div 7 = 3$. “How many groups of 7 in 21? There are 3 groups of 7 in 21.” Emphasize, too, the relationship between multiplication and division. Use counters or arrays to demonstrate that by finding a missing factor, we can find the missing quotient.

Example

$\blacksquare \times 4 = 12$ $12 \div 4 = \blacksquare$
“How many groups of 4 in 12?”
 $3 \times 4 = 12$ $12 \div 4 = 3$
“There are 3 groups of 4 in 12.”

ACTIVITIES

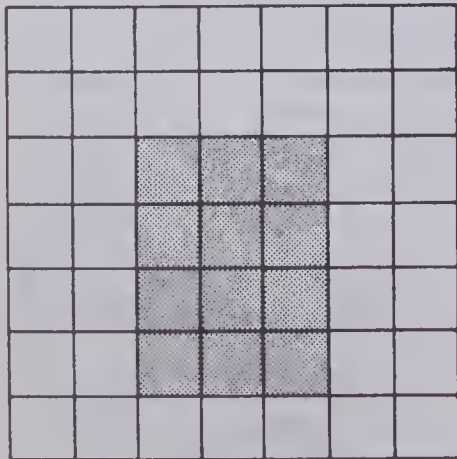
1. Students might enjoy playing “Concentration” (see Activity Reservoir). Use related multiplication and division facts.

Example

$4 \times 3 = 12$ and $12 \div 3 = 4$.

2. Some students may wish to make coloured arrays on graph paper to illustrate the relationship between multiplication and division.

Example



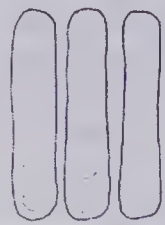
3 groups of 4
 $3 \times 4 = 12$
 $12 \div 4 = 3$

Some students may want to combine their efforts to illustrate a whole multiplication table and the related division sentences, e.g., the “five” times table.

3. Play “Multi-Rummy” as described on page 61, Activity 2. Substitute the addition fact cards with appropriate related division facts.

Multiplication and Division

Brian uses multiplication facts to help him divide.



3 groups of 6.
 $3 \times 6 = 18$



3 groups of 6.
 $18 \div 6 = 3$
↑
Quotient

There are ³ groups of 6 in 18.

The answer to a division question is called the **quotient**.

Exercises

Write a true multiplication sentence and a true division sentence for each array.

	Multiplication	Division
1.	$3 \times 4 = 12$	$12 \div 4 = 3$
2.	$5 \times 3 = 15$	$15 \div 3 = 5$
3.	$2 \times 5 = 10$	$10 \div 5 = 2$

Use multiplication to help you find each quotient.

- | | | | | | |
|--------|------------------------------|----------------------------|--------|------------------------------|----------------------------|
| 3
4 | $\blacksquare \times 7 = 21$ | $21 \div 7 = \blacksquare$ | 8
4 | $\blacksquare \times 2 = 16$ | $16 \div 2 = \blacksquare$ |
| 6 | $\blacksquare \times 6 = 24$ | $24 \div 6 = \blacksquare$ | 7 | $\blacksquare \times 5 = 20$ | $20 \div 5 = \blacksquare$ |
| 2 | $\blacksquare \times 7 = 14$ | $14 \div 7 = \blacksquare$ | 8 | $\blacksquare \times 4 = 32$ | $32 \div 4 = \blacksquare$ |

102 Related sentences

Using the Book Use the display to reinforce the relationship between multiplication and division. You may want to work with the whole class on Exercises 1-3.

More Multiplication and Division

Sandy already knows
 $2 \times 4 = 8$.



Now she can write
 $8 \div 4 = 2$.

She also knows
 $4 \times 2 = 8$.



Now she can write
 $8 \div 2 = 4$.



Exercises

Write a division sentence to match each multiplication sentence.

1. $3 \times 4 = 12$ $12 \div 4 = 3$ 2. $6 \times 3 = 18$ $18 \div 3 = 6$
 $4 \times 3 = 12$ $12 \div 3 = 4$ $3 \times 6 = 18$ $18 \div 6 = 3$
3. $6 \times 5 = 30$ $30 \div 5 = 6$ 4. $4 \times 7 = 28$ $28 \div 7 = 4$ 5. $9 \times 3 = 27$ $27 \div 3 = 9$
 $5 \times 6 = 30$ $30 \div 6 = 5$ $7 \times 4 = 28$ $28 \div 4 = 7$ $3 \times 9 = 27$ $27 \div 9 = 3$

Write another multiplication sentence and two division sentences to match each.

6. $7 \times 6 = 42$ 7. $3 \times 9 = 27$ 8. $2 \times 8 = 16$ 9. $6 \times 2 = 12$
 10. $7 \times 4 = 28$ 11. $5 \times 6 = 30$ 12. $8 \times 4 = 32$ 13. $7 \times 3 = 21$

Complete each. Write one multiplication and two division sentences to match each.

14. $6 \times 8 = \blacksquare 48$ 15. $10 \times 3 = \blacksquare 30$ 16. $5 \times 7 = \blacksquare 35$ 17. $6 \times 7 = \blacksquare 42$
 18. $4 \times 9 = \blacksquare 36$ 19. $7 \times 8 = \blacksquare 56$ 20. $6 \times 4 = \blacksquare 24$ 21. $5 \times 5 = \blacksquare 25$
 22. $5 \times 9 = \blacksquare 45$ 23. $3 \times 7 = \blacksquare 21$ 24. $9 \times 8 = \blacksquare 72$ 25. $6 \times 9 = \blacksquare 54$

Related sentences 103

Using the Book You may wish to work co-operatively with the students on Exercises 1-3. Ensure that each division sentence is properly matched with its multiplication counterpart.

ANSWERS

6. $6 \times 7 = 42$, $42 \div 6 = 7$, $42 \div 7 = 6$ 7. $9 \times 3 = 27$, $27 \div 9 = 3$, $27 \div 3 = 9$ 8. $8 \times 2 = 16$, $16 \div 8 = 2$, $16 \div 2 = 8$ 9. $2 \times 6 = 12$, $12 \div 2 = 6$, $12 \div 6 = 2$ 10. $4 \times 7 = 28$, $28 \div 4 = 7$, $28 \div 7 = 4$ 11. $6 \times 5 = 30$, $30 \div 6 = 5$, $30 \div 5 = 6$ 12. $4 \times 8 = 32$, $32 \div 4 = 8$, $32 \div 8 = 4$ 13. $3 \times 7 = 21$, $21 \div 3 = 7$, $21 \div 7 = 3$
 14. $8 \times 6 = 48$, $48 \div 8 = 6$, $48 \div 6 = 8$ 15. $3 \times 10 = 30$, $30 \div 3 = 10$, $30 \div 10 = 3$ 16. $7 \times 5 = 35$, $35 \div 7 = 5$, $35 \div 5 = 7$ 17. $7 \times 6 = 42$, $42 \div 7 = 6$, $42 \div 6 = 7$ 18. $9 \times 4 = 36$, $36 \div 9 = 4$, $36 \div 4 = 9$ 19. $8 \times 7 = 56$, $56 \div 8 = 7$, $56 \div 7 = 8$ 20. $4 \times 6 = 24$, $24 \div 4 = 6$, $24 \div 6 = 4$
 21. $25 \div 5 = 5$ 22. $9 \times 5 = 45$, $45 \div 9 = 5$, $45 \div 5 = 9$ 23. $7 \times 3 = 21$, $21 \div 7 = 3$, $21 \div 3 = 7$
 24. $8 \times 9 = 72$, $72 \div 8 = 9$, $72 \div 9 = 8$ 25. $9 \times 6 = 54$, $54 \div 9 = 6$, $54 \div 6 = 9$

ACTIVITIES

1. A blank matrix (e.g., multiplication grid) could be used to record and reinforce basic division facts. It promotes and provides a practical application for inverse operations.

Example

\times	1	2	3	4	5	6
1						
2				8		
3						
4						

\downarrow
 $2 \times 4 = 8$ shows $8 \div 4 = 2$.
 $4 \times 2 = 8$ shows $8 \div 2 = 4$.

2. Provide co-operative charts as described in the Initial Activity, but

OBJECTIVE

To write a division sentence related to a multiplication sentence

PACING

Level A All
 Level B All
 Level C All

SUGGESTIONS

Initial Activity Review briefly the Commutative Property of Multiplication (the Order Principle — page 68).

Develop division sentences for the two multiplication sentences (the multiplication fact and the related fact with the same factors in commuted order). You might consider developing co-operatively a chart similar to this one:

Array	Multiplication Sentence	Division Sentence
(a)	$3 \times 5 = 15$ (3 groups of 5)	$15 \div 5 = 3$ (3 groups of 5)
(b)	$5 \times 3 = 15$ (5 groups of 3)	$15 \div 3 = 5$ (5 groups of 3)

Encourage students to verbalize the potential questions asked by the division sentences in order to help them distinguish between the number of sets or groups, and the number of members in a set or group.

Example

- (a) "How many sets of 5 in 15?" (3 sets with 5 in each set)
 (b) "How many sets of 3 in 15?" (5 sets with 3 in each set)

with various components missing. Have the students fill in the missing array, multiplication sentence, or division sentence for various division facts.

3. See the "Flash" idea in the Activity Reservoir.

4. Provide a "fill in the spaces" activity such as:

$2 \times 6 = \blacksquare$ $12 \div \blacksquare = 2$
 $3 \times 7 = \blacksquare$ $21 \div \blacksquare = 3$
 $4 \times 5 = \blacksquare$ $\blacksquare \div 5 = 4$
 $6 \times \blacksquare = 18$ $18 \div 3 = \blacksquare$
 etc.

OBJECTIVE

To divide using the "two" to "five" facts

PACING

Level A All
Level B All
Level C All

ACTIVITIES

1. Students may wish to graph their results by using 5×6 matrix. Shaded cells would indicate correct answers.

Example (Shows 4 out of 5 correct.)
Exercises 5-34

Exercises 5-9

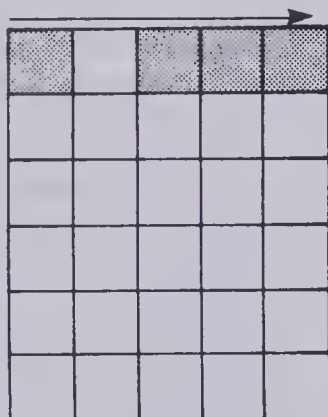
Exercises 10-14

Exercises 15-19

Exercises 20-24

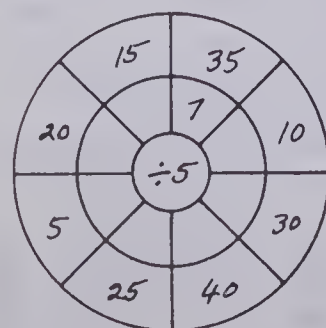
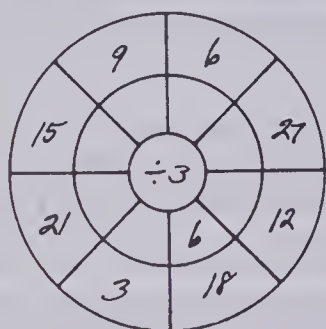
Exercises 25-29

Exercises 30-34



2. Students could construct Basic Fact Wheels as described on page 70, with multiplication facts on one side and division facts on the other side. Note that only the multiplication side for zero will be completed, with the division side left blank, because we do not divide by zero.

3. Provide, or have students construct, Operation Wheels (DM19) as illustrated.



Division Facts

Find each quotient. Remember that multiplication can help you.

1. Two Facts

- (a) $8 \div 2 = 4$ (b) $14 \div 2 = 7$ (c) $4 \div 2 = 2$ (d) $6 \div 2 = 3$
(e) $18 \div 2 = 9$ (f) $10 \div 2 = 5$ (g) $16 \div 2 = 8$ (h) $12 \div 2 = 6$

2. Three Facts

- (a) $12 \div 3 = 4$ (b) $21 \div 3 = 7$ (c) $15 \div 3 = 5$ (d) $6 \div 3 = 2$
(e) $27 \div 3 = 9$ (f) $18 \div 3 = 6$ (g) $24 \div 3 = 8$ (h) $9 \div 3 = 3$

3. Four Facts

- (a) $12 \div 4 = 3$ (b) $20 \div 4 = 5$ (c) $36 \div 4 = 9$ (d) $28 \div 4 = 7$
(e) $8 \div 4 = 2$ (f) $32 \div 4 = 8$ (g) $16 \div 4 = 4$ (h) $24 \div 4 = 6$

4. Five Facts

- (a) $20 \div 5 = 4$ (b) $35 \div 5 = 7$ (c) $10 \div 5 = 2$ (d) $45 \div 5 = 9$
(e) $30 \div 5 = 6$ (f) $15 \div 5 = 3$ (g) $40 \div 5 = 8$ (h) $25 \div 5 = 5$

Divide.

5. $12 \div 3 = 4$ 6. $20 \div 5 = 4$ 7. $24 \div 3 = 8$ 8. $10 \div 2 = 5$ 9. $45 \div 5 = 9$
10. $14 \div 2 = 7$ 11. $18 \div 3 = 6$ 12. $28 \div 4 = 7$ 13. $32 \div 4 = 8$ 14. $16 \div 4 = 4$
15. $21 \div 3 = 7$ 16. $15 \div 3 = 5$ 17. $20 \div 4 = 5$ 18. $30 \div 3 = 10$ 19. $24 \div 4 = 6$
20. $30 \div 5 = 6$ 21. $18 \div 2 = 9$ 22. $36 \div 4 = 9$ 23. $35 \div 5 = 7$ 24. $12 \div 2 = 6$
25. $40 \div 5 = 8$ 26. $12 \div 4 = 3$ 27. $25 \div 5 = 5$ 28. $20 \div 2 = 10$ 29. $27 \div 3 = 9$
30. $16 \div 2 = 8$ 31. $50 \div 5 = 10$ 32. $14 \div 2 = 7$ 33. $40 \div 4 = 10$ 34. $15 \div 5 = 3$

104 Dividing by 2, 3, 4, and 5

Using the Book This page can be assigned as an oral exercise (where students record the quotient as you read the division phrase) or as an independent written exercise. Correct any errors in Exercises 1-4 before assigning Exercises 5-34.

No time limit is intended. However, you may want to assign this page again at a later date and record students' times.

(Continued from page 101)

"Using 15 counters (candies), find "fair shares" for 3 people (Bob, Sue, Ted)." Students place 15 counters at the top of the mat, then place counters, one at a time, in the appropriate boxes. (Figure 1 shows that the sharing process has started.)

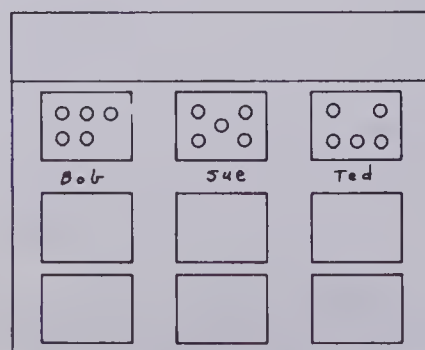


Figure 2

Sharing is completed. Figure 2 shows that, using 15, there are 5 fair shares for each of 3 people or $15 \div 3 = 5$.

Division Mats can be used as an introductory activity, a method of review, a method to develop basic division facts, a device to provide further understanding of the concept of division, and an excellent approach to develop the idea of remainders. Word problems can also be demonstrated concretely using the Division Mat.

EXTRA PRACTICE

HMS—DM28.

Division Facts

Complete these tables.

1. Divide by 2

16	8
4	2
12	■ 6
18	■ 9
6	■ 3
14	■ 7
10	■ 5
8	■ 4

2. Divide by 5

20	4
10	■ 2
15	■ 3
35	■ 7
25	■ 5
40	■ 8
45	■ 9
30	■ 6

3. Divide by 3

21	7
6	■ 2
15	■ 5
24	■ 8
12	■ 4
18	■ 6
9	■ 3
27	■ 9

Divide.

- 3 $\overline{)18}$ 6 5 $\overline{)30}$ 6 4 $\overline{)28}$ 7 2 $\overline{)12}$ 6 4 $\overline{)20}$ 5
 9. 3 $\overline{)9}$ 3 10. 4 $\overline{)16}$ 4 11. 5 $\overline{)15}$ 3 12. 5 $\overline{)45}$ 9 13. 4 $\overline{)24}$ 6
 14. 3 $\overline{)27}$ 9 15. 5 $\overline{)40}$ 8 16. 4 $\overline{)36}$ 9 17. 3 $\overline{)12}$ 4 18. 4 $\overline{)8}$ 2
 19. 3 $\overline{)3}$ 1 20. 4 $\overline{)32}$ 8 21. 5 $\overline{)35}$ 7 22. 4 $\overline{)4}$ 1 23. 5 $\overline{)5}$ 1
 24. 5 $\overline{)20}$ 4 25. 2 $\overline{)18}$ 9 26. 3 $\overline{)6}$ 2 27. 5 $\overline{)10}$ 2 28. 2 $\overline{)2}$ 1
 29. 4 $\overline{)40}$ 10 30. 3 $\overline{)21}$ 7 31. 4 $\overline{)12}$ 3 32. 2 $\overline{)20}$ 10 33. 3 $\overline{)15}$ 5
 34. 2 $\overline{)16}$ 8 35. 5 $\overline{)5}$ 1 36. 3 $\overline{)24}$ 8 37. 4 $\overline{)20}$ 5 38. 5 $\overline{)25}$ 5

★ 39. Find the missing numbers.

A	18	12	20	■ 6	15	■ 24	35	27	14	■ 32
B	2	■ 4	5	2	■ 3	4	5	■ 3	2	4
Quotient	9	3	■ 4	8	5	6	■ 7	9	■ 7	8

OBJECTIVE

To provide further practice using the "two" to "five" facts

PACING

Level A 4-33

Level B 1-28

Level C 1-3, 19-39

ACTIVITIES

1. Ask students to draw arrays for selected exercises from this page. Have them label each with a multiplication and division sentence.

2. Play "Concentration" as described in the Activity Reservoir using division facts and quotients.

$$5 \overline{)30}$$

$$6$$

etc.

$$3 \overline{)24}$$

$$8$$

3. The Multiplication Fact Wheels as described on page 70 can be modified to display division facts.

Using the Book Ensure that students understand how to complete the function tables in Exercises 1-3.

Exercises 4-38 should be assigned as written work. Encourage students to check the quotient by mental multiplication.

Example

$$3 \overline{)18} \longrightarrow 3 \overline{)18} \xrightarrow{6} \begin{array}{r} 6 \\ 3 \overline{)18} \\ \underline{18} \\ 0 \end{array}$$

OBJECTIVE

To write the quotient when:

- the divisor is 1
- the divisor and dividend are identical

PACING

- Level A All
Level B All
Level C All

SUGGESTIONS

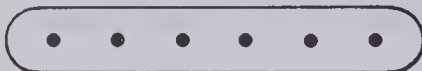
Initial Activity Consider using the display to introduce this lesson. Have students draw a number of arrays in their notebooks to illustrate multiplication sentences and their commuted counterparts.

Example

"Draw an array to show 6 groups of 1."



"Now draw an array to show 1 group of 6."



Using the format of the display, develop the appropriate division sentences.

ACTIVITIES

1. Have the children complete selected exercises and write a related division sentence for each.

2. Prepare (have the children help!) some Fact Flip Cards. Children work their way through a card quickly writing answers on a paper strip. Cards are self-checking when turned over.

Front

Back

14 ÷ 7
15 ÷ 5
24 ÷ 3
18 ÷ 3
20 ÷ 4
35 ÷ 7

2
3
8
6
5
5

3. Play "Bingo" as described in the Activity Reservoir using division facts.

One — A Special Number in Division



5 groups of 1.

$$5 \times 1 = 5$$

$$5 \div 1 = \blacksquare 5$$

What happens when you divide by 1?

$$2 \times 1 = 2$$

$$2 \div 1 = 2$$

$$3 \blacksquare \times 1 = 3$$

$$3 \div 1 = \blacksquare 3$$

$$4 \blacksquare \times 1 = 4$$

$$4 \div 1 = \blacksquare 4$$

A number divided by 1 remains unchanged.



1 group of 5.

$$1 \times 5 = 5$$

$$5 \div 5 = \blacksquare 1$$

What happens when a number is divided by itself?

$$1 \times 2 = 2$$

$$2 \div 2 = 1$$

$$1 \blacksquare \times 3 = 3$$

$$3 \div 3 = \blacksquare 1$$

$$1 \blacksquare \times 4 = 4$$

$$4 \div 4 = \blacksquare 1$$

When a number is divided by itself, the quotient is 1.

Exercises

Find each quotient.

1. $3 \div 1$ 3

2. $2 \div 2$ 1

3. $9 \div 9$ 1

4. $8 \div 1$ 8

5. $6 \div 1$ 6

6. $4 \div 4$ 1

7. $1 \div 1$ 1

8. $27 \div 1$ 27

9. $7 \div 1$ 7

10. $5 \div 5$ 1

11. $6 \div 6$ 1

12. $17 \div 1$ 17

13. $23 \div 1$ 23

14. $15 \div 15$ 1

15. $32 \div 32$ 1

16. $93 \div 93$ 1

17. $85 \div 1$ 85

18. $12 \div 12$ 1

19. $68 \div 68$ 1

20. $126 \div 1$ 126

21. $16 \div 4$ 4

22. $18 \div 3$ 6

23. $36 \div 4$ 9

24. $27 \div 3$ 9

25. $24 \div 24$ 1

26. $45 \div 5$ 9

27. $9 \div 3$ 3

28. $10 \div 5$ 2

29. $32 \div 4$ 8

30. $35 \div 5$ 7

Using the Book You may wish to have students work co-operatively to solve the number patterns, or work individually in their notebooks. Whatever the case, encourage students to develop generalizations in their own words to explain the relationships.

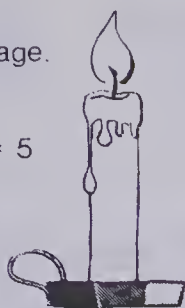
The Factory

20 candles.
4 candles in every package.
How many packages?

$$20 \div 4 = 5$$

There are 5 packages.

This question asks:
"How many groups?"



20 candles.
5 packages.
How many candles in each package?

$$20 \div 5 = 4$$

There are 4 candles in each package.

This question asks:
"How many in each group?"

Exercises

Solve. Tell which question is being asked.



1. George made 36 race cars.
He packed 4 race cars in every box. *How many groups?*
How many boxes did he pack? 9

2. Edna packed 27 spaceships.
They are packed in 3 boxes.
How many spaceships in each box? 9 *How many in each group?*

3. Brenda made 45 dolls.
Five dolls fit in a box. *How many groups?*
How many boxes did Brenda need? 9

4. Stan packed 32 paint kits.
He used 4 cartons.
How many paint kits in each carton? 8 *How many in each group?*

- ★5. One box can hold 4 large dolls or 6 small trucks.
Brenda has 28 dolls and 42 trucks. *How many groups?*
How many boxes will she need to pack the dolls? 7 the trucks? 7
How many boxes will she need altogether? 14

Division problems 107

Using the Book Note that Exercises 1, 3, and 5 are of the Measurement type and Exercises 2 and 4 are of the Partitive type.

ACTIVITIES

1. Prepare (or cut from old Arithmetic texts) a set of division word problems of the type found on this page. Put these in envelopes or other suitable containers. Prepare also a set of answering division statements on cards. Be sure to (a) include the measurement and partitive statements and (b) have more solution cards than problems. The task is to sort the solution cards into their appropriate word problem containers. When finished, have each child give the containers to a classmate

who checks, and (if all correct) re-shuffles for the next twosome.

2. Place 5 or 6 division phrases on the board. Ask students to relate these to real objects. Use these as the basis for mini-problems.

$$35 \div 5$$

Chocolate Packages
squares

How many in each package?
(35 ÷ 5 = 7)

3. Use idea 2 above or cards as shown to help the children write their own word problems.

OBJECTIVES

To solve word problems involving division

To identify the type of question being asked by the division sentence

PACING

Level A 1-4

Level B 1-4

Level C 2-5

SUGGESTIONS

Initial Activity Use several chalkboard examples to help children relate the numerical terms in a division statement to real objects identified in a word problem. (Bracketed parts are for teacher reference only.)

Example

24 cans of pop.
6 in each carton.
How many cartons?

24	÷	6	=	■
Total no. of cans		No. in each carton		No. of cartons?

(Total no. of elements)	(No. of elements in each set)	(No. of sets?)
----------------------------	--	-------------------

(Measurement Concept)

24 cans of pop.
4 cartons.
How many cans in each carton?

24	÷	4	=	■
Total no. of cans		No. of cartons		No. in each carton?

(Total no. of elements)	(No. of sets)	(No. of elements in each set?)
----------------------------	------------------	--------------------------------------

(Partitive Concept)

Emphasize the question asked by each division sentence. Relate the number of cartons to the question "How many groups?", and the number of cans of pop in each carton to the question "How many in each group?" (refer to the use of the Division Mat, page 101).

David planted ____ flowers.
There were ____ in each row.
How many rows?

Sharon ____ 24 oranges.
8 teammates.
_____?

OBJECTIVE

To divide using the "six" and "seven" facts

PACING

Level A All
Level B All
Level C All

RELATED AIDS

BFA COMP LAB II—46.

SUGGESTIONS

Initial Activity Use examples as shown in the display to review briefly how division is related to multiplication.

ACTIVITIES

1. Play "Concentration" as described in the Activity Reservoir, using appropriate facts.

Example

$48 \div 6 = 8$ and $6 \times 8 = 48$
or $48 \div \blacksquare = 8$ and $\blacksquare \times 8 = 48$.

2. Add appropriate matching cards to the deck in Activity 1 showing the division algorithm to play "Triple Concentration".

Example

$$\begin{array}{r} 8 \\ 6 \overline{)48} \end{array} \quad \text{and} \quad \begin{array}{r} 6 \\ 8 \overline{)48} \end{array}$$

or $\begin{array}{r} 8 \\ \blacksquare \overline{)48} \end{array} \quad \text{and} \quad \begin{array}{r} 6 \\ \blacksquare \overline{)48} \end{array}$

Dividing by 6 and 7



Maria knows

$$8 \times 6 = 48.$$

$$9 \times 7 = 63.$$



Now she can write

$$48 \div 6 = 8.$$

$$63 \div 7 = 9.$$

Exercises

Write a division sentence to match each multiplication sentence.

● $4 \times 6 = 24$
 $24 \div 6 = 4$

● $5 \times 6 = 30$
 $30 \div 6 = 5$

● $6 \times 6 = 36$
 $36 \div 6 = 6$

4. $7 \times 6 = 42$
 $42 \div 6 = 7$

5. $8 \times 6 = 48$
 $48 \div 6 = 8$

6. $9 \times 6 = 54$
 $54 \div 6 = 9$

7. $4 \times 7 = 28$
 $28 \div 7 = 4$

8. $5 \times 7 = 35$
 $35 \div 7 = 5$

9. $6 \times 7 = 42$
 $42 \div 7 = 6$

10. $7 \times 7 = 49$
 $49 \div 7 = 7$

11. $8 \times 7 = 56$
 $56 \div 7 = 8$

12. $9 \times 7 = 63$
 $63 \div 7 = 9$

Find each quotient.

13. Six Facts

(a) $12 \div 6 = 2$ (b) $24 \div 6 = 4$ (c) $36 \div 6 = 6$ (d) $48 \div 6 = 8$ (e) $6 \div 6 = 1$

(f) $54 \div 6 = 9$ (g) $18 \div 6 = 3$ (h) $30 \div 6 = 5$ (i) $42 \div 6 = 7$ (j) $60 \div 6 = 10$

14. Seven Facts

(a) $21 \div 7 = 3$ (b) $42 \div 7 = 6$ (c) $28 \div 7 = 4$ (d) $56 \div 7 = 8$ (e) $63 \div 7 = 9$

(f) $14 \div 7 = 2$ (g) $35 \div 7 = 5$ (h) $7 \div 7 = 1$ (i) $49 \div 7 = 7$ (j) $70 \div 7 = 10$

Divide.

● $6 \overline{)48} = 8$

● $7 \overline{)42} = 6$

● $6 \overline{)54} = 9$

18. $7 \overline{)49} = 7$

19. $6 \overline{)36} = 6$

20. $6 \overline{)18} = 3$

21. $7 \overline{)21} = 3$

22. $7 \overline{)56} = 8$

23. $6 \overline{)30} = 5$

24. $7 \overline{)35} = 5$

25. $6 \overline{)24} = 4$

26. $7 \overline{)63} = 9$

108 Dividing by 6 and 7

Using the Book Upon completion of Exercises 1-14, have students correct any errors.

Use Exercises 15-26 to develop awareness of the division algorithm.

Example

$$\begin{array}{r} 8 \\ 6 \overline{)48} \end{array} \longrightarrow \begin{array}{r} 8 \\ 6 \overline{)48} \\ \underline{48} \\ 0 \end{array}$$

Check by multiplying.

Dividing by 8 and 9

Marcel knows

$$9 \times 8 = 72.$$

$$7 \times 9 = 63.$$



Now he can write

$$72 \div 8 = 9.$$

$$63 \div 9 = 7.$$



Exercises

Write a division sentence to match each multiplication sentence.

● $4 \times 8 = 32$
 $32 \div 8 = 4$

● $5 \times 8 = 40$
 $40 \div 8 = 5$

● $6 \times 8 = 48$
 $48 \div 8 = 6$

4. $7 \times 8 = 56$
 $56 \div 8 = 7$

5. $8 \times 8 = 64$
 $64 \div 8 = 8$

6. $9 \times 8 = 72$
 $72 \div 8 = 9$

7. $4 \times 9 = 36$
 $36 \div 9 = 4$

8. $5 \times 9 = 45$
 $45 \div 9 = 5$

9. $6 \times 9 = 54$
 $54 \div 9 = 6$

10. $7 \times 9 = 63$
 $63 \div 9 = 7$

11. $8 \times 9 = 72$
 $72 \div 9 = 8$

12. $9 \times 9 = 81$
 $81 \div 9 = 9$

Find each quotient.

13. Eight Facts

(a) $16 \div 8 = 2$ (b) $32 \div 8 = 4$ (c) $24 \div 8 = 3$ (d) $40 \div 8 = 5$ (e) $80 \div 8 = 10$

(f) $72 \div 8 = 9$ (g) $8 \div 8 = 1$ (h) $56 \div 8 = 7$ (i) $64 \div 8 = 8$ (j) $48 \div 8 = 6$

14. Nine Facts

(a) $45 \div 9 = 5$ (b) $36 \div 9 = 4$ (c) $90 \div 9 = 10$ (d) $54 \div 9 = 6$ (e) $72 \div 9 = 8$

(f) $81 \div 9 = 9$ (g) $18 \div 9 = 2$ (h) $9 \div 9 = 1$ (i) $27 \div 9 = 3$ (j) $63 \div 9 = 7$

Divide.

● $8 \overline{)32} 4$ ● $9 \overline{)27} 3$ ● $9 \overline{)72} 8$ 18. $9 \overline{)63} 7$ 19. $8 \overline{)40} 5$ 20. $8 \overline{)48} 6$

21. $9 \overline{)36} 4$ 22. $8 \overline{)56} 7$ 23. $9 \overline{)54} 6$ 24. $8 \overline{)72} 9$ 25. $9 \overline{)81} 9$ 26. $8 \overline{)64} 8$

Dividing by 8 and 9 109

OBJECTIVE

To divide using the "eight" and "nine" facts

PACING

Level A All

Level B All

Level C All

RELATED AIDS

HMS—DM29.

SUGGESTIONS

Initial Activity You may wish to put

$4 \times 8 = 32$, $32 \div 8 = 4$, and $8 \overline{)32}$ on the chalkboard and ask: "How are these related?" ($4 \times 8 = 32$ is a multiplication fact, while $32 \div 8$ and $8 \overline{)32}$ are simply 2 ways of writing the related division statement).

ACTIVITIES

1. If you have not already done so, see the activities on the previous page.

2. Prepare a "fill in the blanks" exercise such as:

(a) $3 \times 7 = \blacksquare$ $21 \div 7 = \blacksquare$ $7 \overline{)21}$

(b) $4 \times 9 = \blacksquare$ $36 \div \blacksquare = 4$ $9 \overline{)\blacksquare}$

(c) $6 \times \blacksquare = 36$ $\blacksquare \div 6 = 6$ $\blacksquare \overline{)36}$

(d) $\blacksquare \times 9 = 63$ $63 \div 9 = \blacksquare$ $9 \overline{)63}$
etc.

3. See DM29.

Using the Book Point out to the children that the process used on this page is a continuation of the previous page.

For those who need it, point out that the answers to Exercises 1-3 and 15-17 can be found in the back of the book as a check to make sure they are on the right track.

OBJECTIVE

To practise the basic division facts

PACING

Level A All

Level B All

Level C All

RELATED AIDS

HMS — DM19 and DM29.

BFA PROB. SOLVING LAB II — 46, 51, 52, 54, 213.

ACTIVITIES

1. If you have not already done so, see DM29.

2. Encourage those students who are still having difficulty to make up sets of fact cards for on-going drill.

Example

The "2" facts — $2 \div 2 = \blacksquare$

$4 \div 2 = \blacksquare$

$6 \div 2 = \blacksquare$

etc.

Some reteaching may be necessary for these students to emphasize the relationship between division and multiplication (inverse statements).

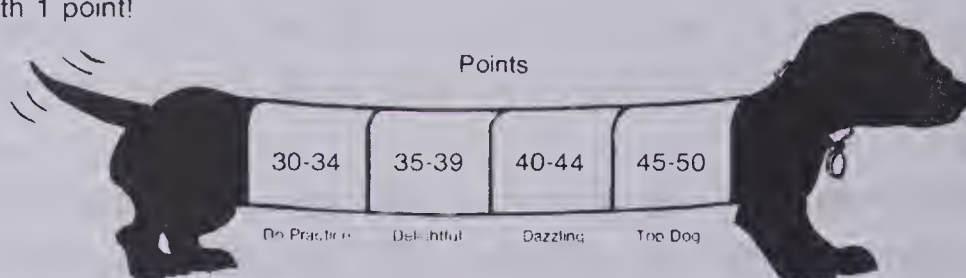
Tune Up

Divide.

1. $30 \div 6 = 5$ 2. $48 \div 8 = 6$ 3. $20 \div 5 = 4$ 4. $63 \div 9 = 7$ 5. $16 \div 2 = 8$
6. $12 \div 3 = 4$ 7. $49 \div 7 = 7$ 8. $21 \div 3 = 7$ 9. $18 \div 6 = 3$ 10. $14 \div 2 = 7$
11. $4 \overline{)32} = 8$ 12. $9 \overline{)27} = 3$ 13. $8 \overline{)32} = 4$ 14. $4 \overline{)24} = 6$ 15. $7 \overline{)28} = 4$
16. $8 \overline{)64} = 8$ 17. $2 \overline{)18} = 9$ 18. $9 \overline{)36} = 4$ 19. $6 \overline{)24} = 4$ 20. $4 \overline{)16} = 4$
21. $25 \div 5 = 5$ 22. $35 \div 7 = 5$ 23. $18 \div 3 = 6$ 24. $16 \div 8 = 2$ 25. $45 \div 5 = 9$
26. $6 \overline{)48} = 8$ 27. $9 \overline{)45} = 5$ 28. $4 \overline{)28} = 7$ 29. $6 \overline{)36} = 6$ 30. $7 \overline{)63} = 9$
31. $7 \overline{)14} = 2$ 32. $9 \overline{)81} = 9$ 33. $7 \overline{)21} = 3$ 34. $3 \overline{)15} = 5$ 35. $6 \overline{)42} = 7$
36. $5 \overline{)35} = 7$ 37. $7 \overline{)42} = 6$ 38. $8 \overline{)72} = 9$ 39. $8 \overline{)56} = 7$ 40. $2 \overline{)10} = 5$
41. $12 \div 4 = 3$ 42. $54 \div 9 = 6$ 43. $32 \div 8 = 4$ 44. $40 \div 5 = 8$ 45. $30 \div 5 = 6$
46. $24 \div 3 = 8$ 47. $54 \div 6 = 9$ 48. $72 \div 9 = 8$ 49. $27 \div 3 = 9$ 50. $40 \div 8 = 5$

The "Top Dog" Division Awards!

Each correct answer is worth 1 point!



110 Division practice

Using the Book You may want to assign this page to the whole class, or just to those students whom you think require further practice. Do not assign all at once, but provide several different times for writing.

Basic division facts were presented on pages 104, 105, 108, and 109. Have counters available for those that need them.

Example

$20 \div 5 = \blacksquare$ "How many groups of 5 in 20?"

Rethink as a missing factor.

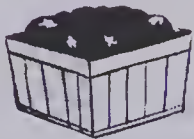
$\blacksquare \times 5 = 20$ "How many groups of 5 make 20?"

Solve, and apply to division.

$4 \times 5 = 20 \longrightarrow 20 \div 5 = 4$

Below is a chart containing points and related percentages for the "Top Dog" Division Awards.

Points	Percents
45-50	90-100%
40-44	80-88%
35-39	70-78%
30-34	60-68%



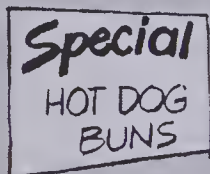
Grocery Store Clerk



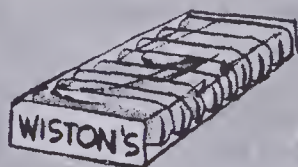
Solve these mini-stories.

- 24 cans of soup needed.
6 cans in each carton.
How many cartons needed? 4
- 32 tomatoes needed.
4 tomatoes in each package.
How many packages needed? 8
- 35 carrots needed.
7 carrots in each bunch.
How many bunches needed? 5
- 56 bags of potato chips needed.
8 bags in a carton.
How many cartons needed? 7
- 6 bottles in a carton.
36 bottles needed.
How many cartons needed? 6
- 48 dinner rolls needed.
Each package has 6 rolls.
How many packages needed? 8
- 6 chocolate puffs in a box.
42 chocolate puffs needed.
How many boxes needed? 7
- 9 apples in a bag.
54 apples needed.
How many bags needed? 6
- 8 wieners in a package.
64 wieners needed.
How many packages needed? 8
- 72 apples needed.
9 apples in each bag.
How many bags needed? 8

BRAINTICKLER



Which is
the better buy?
8 buns for 64¢



8 buns 64¢



8 buns 54¢

Division problems 111

OBJECTIVE

To solve mini-stories using basic division facts

PACING

Level A All
Level B All
Level C All

RELATED AIDS

BFA PROB. SOLVING LAB II — 50.

SUGGESTIONS

Initial Activity Review if necessary, the four questions of Professor Q and the problem-solving format you have established.

Use the "Career Awareness" information in the Chapter Overview (page 100) as a basis for discussion about grocery clerks.

ACTIVITIES

1. See the activities on page 107 for suggestions designed to help children write their own word problems.

2. You may wish to arrange a tour of a local supermarket. Besides learning of the day-to-day operation of a grocery store, many facts can be brought back to the class for use in problem writing, mapping (i.e., "aisle 12 has frozen foods), laying the groundwork for money, making change, and so forth.

3. Some students may enjoy the challenge of a problem such as: Sheena has 10 rabbits and 2 different pens in which to keep them. How many ways can she put the rabbits into the pens? (Answer: 11)

Using the Book As students work through Exercises 1-10, ensure that they use the correct "unit" in the final statement or answer (e.g., cartons, boxes, bunches, etc.).

Note that these mini-stories are all of the Measurement type as described in the Background on the Chapter Overview page and on page 101.

OBJECTIVE

To find the quotient and remainder using an array to match a simple problem

PACING

Level A All
Level B All
Level C All

RELATED AIDS

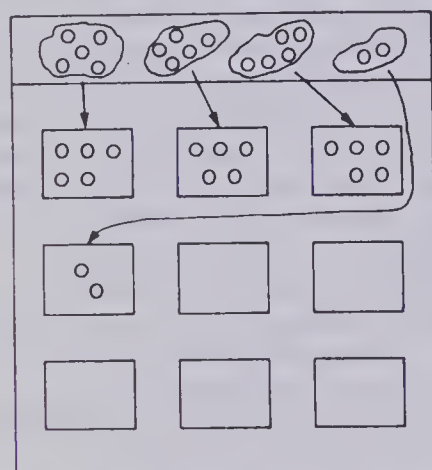
BFA PROB. SOLVING LAB II — 62, 176, 216.

SUGGESTIONS

Initial Activity Provide students with counters and Division Mats. Give students time to experience numerous examples similar to the one in the display.

Example

"Make a pile of 17 counters. Find out how many groups of 5 there are in 17."



Encourage students to verbalize their results, e.g., "There are 3 groups of 5 in 17 with 2 left over."

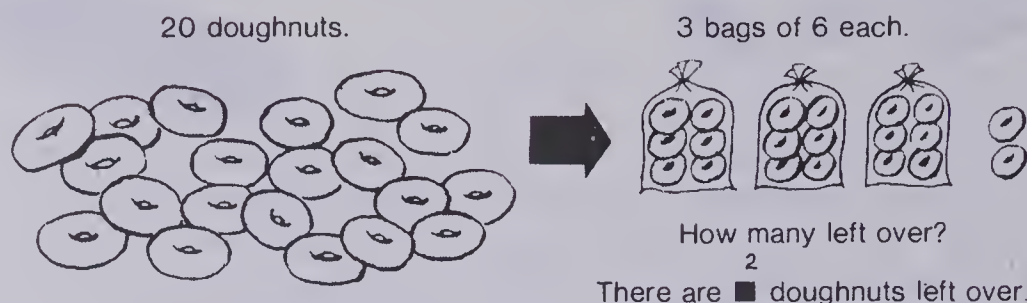
As you work through other examples, encourage students to note that the number of items "left over" is always fewer than the number of items in the equivalent sets or groups.

ACTIVITIES

1. Using the Division Mats and bags or large tins of counters, divide the class into groups of two to play "Remainder". First player closes his/her eyes, takes a handful of counters, and shows an array on the mat. The second player must verbalize the result (e.g., "4 groups of 3 with 2 left over"). The second player scores a number of points equal to the remainder (i.e., in this case, score 2). Players change sides, keeping a cumulative tally of their scores. Player with the highest (or lowest) score after 5 turns is the winner.

2. Children might enjoy playing "21". Two players take 21 counters and

School Bake Sale



Exercises

Draw pictures to help you answer these mini-stories.

- 25 chocolate chip cookies.
How many bags with 7 each? 3
How many left over? 4



- 32 marshmallows.
How many bags with 5 each? 6
How many left over? 2

- 28 peanut butter squares.
How many bags with 6 each? 4
How many left over? 4

- 17 vanilla wafers.
How many bags with 4 each? 4
How many left over? 1

- 23 oatmeal cookies.
How many bags with 5 each? 4
How many left over? 3

- 20 loaves of bread needed.
6 loaves in each box.
How many left over? 2

- 30 apples needed.
4 apples in each box.
How many left over? 2

112 Remainders

Using the Book You may want to work co-operatively with the students on Exercise 1. For the remainder of the exercises, students could use arrays drawn on graph paper to help them visualize the division process. Other students might benefit from the use of a Division Mat for each exercise.

Note that all the mini-stories are of the Measurement type.

Be sure all students are familiar with the accepted answer format.

spread them out randomly on a table surface. They then take turns taking either 1, 2, or 3 counters from the set. Object of the game is to be the player to take the last counter.

Remainders

Lisa has 33 marbles. She puts 8 marbles in each bag.

How many bags?

How many left over?



How many groups of 8 in 33?

How many left over?

Estimate.

$$\begin{array}{r} 4 \\ 8 \overline{)33} \end{array}$$

Think:

$$3 \times 8 = 24 \quad \text{too few}$$

$$4 \times 8 = 32 \quad \text{good}$$

$$5 \times 8 = 40 \quad \text{too many}$$

There are \blacksquare groups of 8 in 33 with \blacksquare left over.

Multiply.

$$\begin{array}{r} 4 \\ 8 \overline{)33} \\ \underline{32} \end{array} \quad (4 \times 8)$$

Subtract.

$$\begin{array}{r} 4 \\ 8 \overline{)33} \\ \underline{-32} \\ 1 \end{array} \quad \text{left over}$$

1 is the remainder.

Show the remainder.

$$\begin{array}{r} 4 \text{ R } 1 \\ 8 \overline{)33} \\ \underline{-32} \\ 1 \end{array}$$

Exercises Divide. Show the remainder.

1. How many groups of 7 in 25? \blacksquare R \blacksquare
How many left over? \blacksquare

$$\begin{array}{r} 3 \text{ R } 4 \\ 7 \overline{)25} \\ \underline{-21} \\ 4 \end{array}$$

2. How many groups of 6 in 32? \blacksquare R \blacksquare
How many left over? \blacksquare

$$\begin{array}{r} 5 \text{ R } 2 \\ 6 \overline{)32} \\ \underline{-30} \\ 2 \end{array}$$

$$\begin{array}{r} 7 \text{ R } 1 \\ 4 \overline{)29} \\ \underline{-28} \\ 1 \end{array}$$

$$\begin{array}{r} 8 \text{ R } 2 \\ 3 \overline{)26} \\ \underline{-24} \\ 2 \end{array}$$

$$\begin{array}{r} 6 \text{ R } 3 \\ 7 \overline{)45} \\ \underline{-42} \\ 3 \end{array}$$

$$\begin{array}{r} 4 \text{ R } 3 \\ 6 \overline{)27} \\ \underline{-24} \\ 3 \end{array}$$

$$\begin{array}{r} 7 \text{ R } 1 \\ 5 \overline{)36} \\ \underline{-35} \\ 1 \end{array}$$

$$\begin{array}{r} 8 \text{ R } 2 \\ 6 \overline{)50} \\ \underline{-48} \\ 2 \end{array}$$

$$\begin{array}{r} 8 \text{ R } 3 \\ 4 \overline{)35} \\ \underline{-32} \\ 3 \end{array}$$

$$\begin{array}{r} 9 \text{ R } 4 \\ 9 \overline{)86} \\ \underline{-81} \\ 5 \end{array}$$

$$\begin{array}{r} 5 \text{ R } 7 \\ 8 \overline{)47} \\ \underline{-40} \\ 7 \end{array}$$

$$\begin{array}{r} 7 \text{ R } 4 \\ 9 \overline{)68} \\ \underline{-63} \\ 5 \end{array}$$

$$\begin{array}{r} 8 \text{ R } 5 \\ 8 \overline{)75} \\ \underline{-72} \\ 3 \end{array}$$

$$\begin{array}{r} 7 \text{ R } 3 \\ 7 \overline{)30} \\ \underline{-28} \\ 2 \end{array}$$

$$\begin{array}{r} 5 \text{ R } 4 \\ 5 \overline{)19} \\ \underline{-15} \\ 4 \end{array}$$

$$\begin{array}{r} 4 \text{ R } 2 \\ 7 \overline{)60} \\ \underline{-56} \\ 4 \end{array}$$

$$\begin{array}{r} 8 \text{ R } 4 \\ 8 \overline{)60} \\ \underline{-64} \\ 4 \end{array}$$

Remainders 113

Using the Book Place the example used in the display on the chalkboard. Work carefully through the steps of the procedure for the algorithm. Emphasize the importance of an appropriate estimate — that is, a product which, when subtracted from the dividend, provides a remainder less than the divisor.

When the four steps in the display have been completed to yield “4 R 1”, read or have read the summary statement at the bottom of the display (i.e., “There are 4 groups of 8 in 33 with 1 left over.”).

Work through Exercises 1 and 2 orally using the steps in the display and have the children supply the correct number for each \blacksquare . Be sure to have someone make a summary statement.

Exercises 3-6 may also be done orally or at the chalkboard if necessary. The answers to these may be found at the back of the book.

Assign the exercises.

ACTIVITIES

1. Provide the students with “estimation charts” as described in the Initial Activity for the various multiplication tables.

2. See “Marathon” as described in the Activity Reservoir. Be sure to have the children write numbers, some of which, when divided, will yield remainders.

EXTRA PRACTICE

See HMS — DM30.

OBJECTIVE

To divide with a 1-digit divisor and 1-digit quotient using the division algorithm (with remainders)

PACING

Level A All

Level B All

Level C All

VOCABULARY

remainder

RELATED AIDS

HMS — DM30.

BFA COMP LAB II — 47.

BFA PROB. SOLVING LAB II — 63.

SUGGESTIONS

Initial Activity This lesson provides students with a more formal device for finding quotients and remainders. Pupil success with the algorithm will depend largely upon:

- (a) multiplication skills;
- (b) subtraction skills;
- (c) the ability to estimate a product slightly less but not greater than the dividend.

You may wish, then, to spend some time drilling basic multiplication and subtraction facts. Consider, also, providing exercises similar to this one for estimation practice:

“Find how many groups of 7 for each number. Record the remainder. Use the multiplication facts to help if you wish! Part (a) is done for you!”

$$\begin{array}{ll} 1 \times 7 = 7 & 6 \times 7 = 42 \\ 2 \times 7 = 14 & 7 \times 7 = 49 \\ 3 \times 7 = 21 & 8 \times 7 = 56 \\ 4 \times 7 = 28 & 9 \times 7 = 63 \\ 5 \times 7 = 35 & \end{array}$$

	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
4												
7	31	18	12	39	48	10	25	60	52	20	41	59
28												
3												
Remainder												

Repeat with other multiplication tables.

OBJECTIVE

To provide further practice of division with remainders and estimation

PACING

Level A All
Level B All
Level C All

MATERIALS

counters, Division Mats

RELATED AIDS

HMS — DM31.

SUGGESTIONS

Initial Activity Place the following on the chalkboard to emphasize the importance of estimates.

Example

14 “Dairy Moon” Cakes.

3 in each package.

How many packages? How many left over?

Brian wrote:

$$\begin{array}{r} 3 \text{ R } 5 \\ 3 \overline{) 14} \\ \underline{9} \\ 5 \end{array}$$

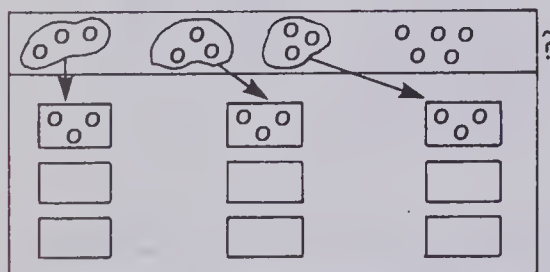
Susan wrote:

$$\begin{array}{r} 5 \text{ R } ? \\ 3 \overline{) 14} \\ \underline{15} \\ ? \end{array}$$

3 packages of 3? 5 packages of 3?

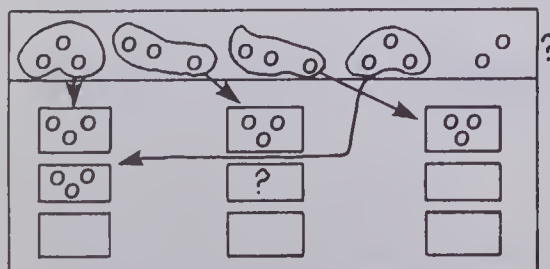
Have students recreate Brian’s strategy on the Division Mats. Then ask, “What is wrong with Brian’s estimate?” Repeat using Susan’s estimate.

Brian



Brian can still make another set of 3.

Susan



Susan does not have enough counters to make the 5th set of 3. Have students indicate the correct estimate of 4.

Example

$$\begin{array}{r} 4 \text{ R } 2 \\ 3 \overline{) 14} \\ \underline{12} \\ 2 \end{array}$$

Estimating

Conrad has 37 marbles.

He puts 7 marbles in each bag.

How many bags? How many left over?



$$\begin{array}{r} 5 \text{ R } 2 \\ 7 \overline{) 37} \\ \underline{35} \\ 2 \end{array}$$

There are 5 bags of 7 and 2 left over.

Exercises

Divide. Remember to estimate first.

1. $8 \overline{) 46}$ $5 \text{ R } 6$ $8 \overline{) 46}$ 40 6 $7 \overline{) 42}$ $6 \text{ R } 0$ $5 \overline{) 28}$ $5 \text{ R } 3$ $4 \overline{) 27}$ $6 \text{ R } 3$
5. $3 \overline{) 19}$ $6 \text{ R } 1$ 6. $6 \overline{) 38}$ $6 \text{ R } 2$ 7. $3 \overline{) 29}$ $9 \text{ R } 2$ 8. $5 \overline{) 41}$ $8 \text{ R } 1$ 9. $6 \overline{) 40}$ $6 \text{ R } 4$
10. $7 \overline{) 30}$ $4 \text{ R } 2$ 11. $5 \overline{) 28}$ $5 \text{ R } 3$ 12. $6 \overline{) 33}$ $5 \text{ R } 3$ 13. $4 \overline{) 18}$ $4 \text{ R } 2$ 14. $8 \overline{) 29}$ $3 \text{ R } 5$
15. $7 \overline{) 38}$ $5 \text{ R } 3$ 16. $9 \overline{) 67}$ $7 \text{ R } 4$ 17. $8 \overline{) 37}$ $4 \text{ R } 5$ 18. $7 \overline{) 50}$ $7 \text{ R } 1$ 19. $9 \overline{) 60}$ $6 \text{ R } 6$
20. 32 butter tarts.
How many bags of 5 each? 6
How many left over? 2
21. 34 coconut cookies.
How many bags of 6 each? 5
How many left over? 4

Using the Book Write the following algorithms on the chalkboard.

(a) $\begin{array}{r} 4 \text{ R } 9 \\ 7 \overline{) 37} \\ \underline{28} \\ 9 \end{array}$

(b) $\begin{array}{r} 6 \text{ R } ? \\ 7 \overline{) 37} \\ \underline{42} \\ ? \end{array}$

4 sets of 7?

6 sets of 7?

Ask students to verbally describe the errors in each question. Refer to the display for the correct estimate and remainder.

As the students work on Exercises 2-21, note those whose estimates are too low or too high. You may wish to form a small group (or groups) for reteaching.

ACTIVITIES

1. See “Picking Peaches” in the Activity Reservoir. Be sure to include the type of errors that Brian’s strategy produced (i.e., $7 \text{ R } 6$).

$$\begin{array}{r} 5 \overline{) 41} \\ \underline{35} \\ 6 \end{array}$$

2. See “The Fact Folder” as described in the Activity Reservoir.

EXTRA PRACTICE

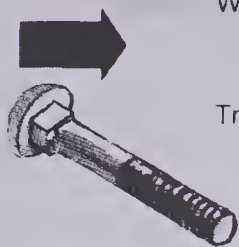
See HMS — DM31.

Dividing Tens, Hundreds, and Thousands

400 bolts.
8 bolts in each package.
How many packages?

$$8 \overline{)400}$$

There are ⁵⁰ packages of bolts



We can use multiplication to help!

$$\blacksquare \times 8 = 400$$

Try. $5 \times 8 = 40$ too few

$$50 \times 8 = 400$$

$$500 \times 8 = 4000$$
 too many

Exercises

Copy and complete the pattern.

1.	To solve:	Use:
	$4 \overline{)20}$	$5 \blacksquare \times 4 = 20$
	$4 \overline{)200}$	$50 \blacksquare \times 4 = 200$
	$4 \overline{)2000}$	$500 \blacksquare \times 4 = 2000$

2.	To solve:	Use:
	$3 \overline{)18}$	$6 \blacksquare \times 3 = 18$
	$3 \overline{)180}$	$60 \blacksquare \times 3 = 180$
	$3 \overline{)1800}$	$600 \blacksquare \times 3 = 1800$

Divide. Complete the multiplication sentence that helped you.

3. $7 \overline{)210}$ ³⁰ $\blacksquare \times 7 = 210$ 4. $8 \overline{)640}$ ⁸⁰ $\blacksquare \times 8 = 640$
5. $6 \overline{)1200}$ ²⁰⁰ $\blacksquare \times 6 = 1200$ 6. $5 \overline{)200}$ ⁴⁰ $\blacksquare \times 5 = 200$
7. $30 \times 8 = 240$ 8. $40 \times 3 = 120$ 9. $20 \times 9 = 180$ 10. $40 \times 4 = 160$ 11. $50 \times 7 = 350$
12. $8 \overline{)240}$ ³⁰ 13. $3 \overline{)120}$ ⁴⁰ 14. $9 \overline{)180}$ ²⁰ 15. $4 \overline{)160}$ ⁴⁰ 16. $7 \overline{)350}$ ⁵⁰
17. $4 \overline{)2400}$ ⁶⁰⁰ 18. $6 \overline{)2400}$ ⁴⁰⁰ 19. $2 \overline{)800}$ ⁴⁰⁰ 20. $5 \overline{)4000}$ ⁸⁰⁰ 21. $6 \overline{)3600}$ ⁶⁰⁰
22. $40 \times 8 = 320$ 23. $40 \times 9 = 360$ 24. $40 \times 5 = 200$ 25. $30 \times 4 = 120$ 26. $20 \times 3 = 60$

Dividing powers of ten 115

OBJECTIVE

To divide with a 1-digit divisor and a dividend which is a multiple of 10, 100, or 1000

PACING

Level A All

Level B All

Level C All

RELATED AIDS

HMS — DM19, DM32, and DM33.

SUGGESTIONS

Initial Activity To introduce this lesson, you might review multiplication when one of the factors is a multiple of 10, 100, or 1000. Use oral or chalkboard examples, e.g., 5×60 , 7×200 , 3×90 , etc.

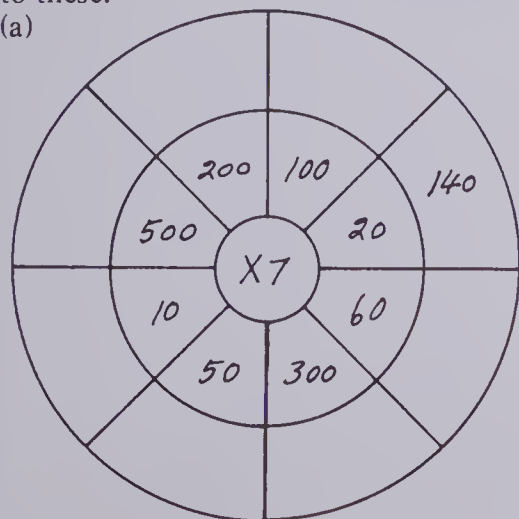
Using the Book Use the display to reinforce the idea of using multiplication to help solve division questions. It would be worthwhile to work co-operatively on Exercises 1 and 2. Based on the patterns, the students may develop their own generalizations. Make sure students understand that, apart from any rules or "short-cuts", we can find missing quotients by thinking of missing factors.

This skill becomes very important in the next lesson as students use multiplication of multiples of 10 to provide estimates of initial quotients.

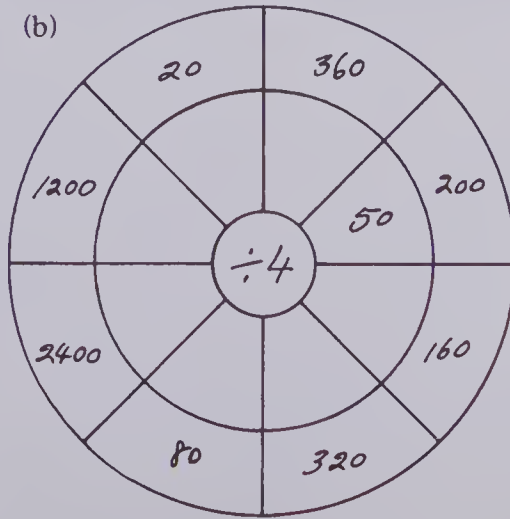
ACTIVITIES

1. Provide Multiplication and Division Operation Wheels (see DM19) similar to these.

(a)



(b)



2. Challenge students to make their own division problems, e.g., "Make a division problem whose divisor is 6 and whose quotient is 3000."

$$\begin{array}{r} 500 \\ 6 \overline{)3000} \end{array}$$

3. Play "Bingo" as described in the Activity Reservoir.

EXTRA PRACTICE

See HMS — DM32 and DM33.

OBJECTIVE

To estimate initial quotients using multiples of 10

PACING

Level A All
Level B All
Level C All

BACKGROUND

This lesson is the first of five lessons that develops the formal division algorithm (pages 116-120). Read through these student pages and the appropriate Teacher's Edition notes quickly to help put this and subsequent lessons in context.

On this page, we are using place value to determine the largest number of 10's in the quotient. Having decided this, we will deal with the number of 1's or units later (see page 117).

SUGGESTIONS

Initial Activity Conduct a *brief* oral practice of multiplication of multiples of 10 (e.g., 3×50 , 6×70 , 3×40 , etc.). The word "multiples" will be used fairly extensively during the next few pages. You may therefore need to review multiples and what they are (see pages 65 and 66).

ACTIVITIES

1. Prepare and distribute a matching exercise such as: Connect correct division questions, multiplication sentences, and estimates with a solid line.

Division Multiplication

Question Sentence Estimate

$4 \overline{)165}$	5×50	450
$5 \overline{)253}$	2×70	360
$3 \overline{)212}$	4×90	210
$6 \overline{)315}$	4×40	250
$2 \overline{)156}$	5×90	140
$7 \overline{)293}$	6×50	280
$4 \overline{)377}$	3×70	160
$5 \overline{)462}$	7×40	300

etc.

Be sure to include several matching sets that have the same divisor.

Larger Quotients

$$164 \div 5$$

About how many groups of 5 in 164?

$$\begin{array}{r} 30 \\ 5 \overline{)164} \end{array}$$

There are about $\overset{30}{\blacksquare}$ groups of 5 in 164.

Use multiples of 10.

Think: $10 \times 5 = 50$ too few
 $20 \times 5 = 100$ too few
 $30 \times 5 = 150$ good choice
 $40 \times 5 = 200$ too many

Exercises

1. Write the next five multiples of 10.

10, 20, 30, 40, \blacksquare , \blacksquare , \blacksquare , \blacksquare , \blacksquare .

$$2. \quad 3 \overline{)72}$$

The estimate is 20.

Think: $10 \times 3 = 30$
 $20 \times 3 = 60$
 $30 \times 3 = 90$

$$3. \quad 3 \overline{)140}$$

The estimate is $\blacksquare.50$

Think: $30 \times 3 = \blacksquare 90$
 $40 \times 3 = \blacksquare 120$
 $50 \times 3 = \blacksquare 150$

$$4. \quad 2 \overline{)185}$$

The estimate is $\blacksquare.90$

Think: $70 \times 2 = \blacksquare 140$
 $80 \times 2 = \blacksquare 160$
 $90 \times 2 = \blacksquare 180$

Estimate the quotient. Use multiples of 10.

$$5. \quad \overset{30}{\blacksquare} 3 \overline{)90}$$

$$6. \quad \overset{20}{\blacksquare} 4 \overline{)93}$$

$$7. \quad \overset{80}{\blacksquare} 2 \overline{)156}$$

$$8. \quad \overset{20}{\blacksquare} 8 \overline{)170}$$

$$9. \quad \overset{20}{\blacksquare} 5 \overline{)114}$$

$$10. \quad \overset{10}{\blacksquare} 6 \overline{)75}$$

$$11. \quad \overset{40}{\blacksquare} 2 \overline{)83}$$

$$12. \quad \overset{60}{\blacksquare} 5 \overline{)283}$$

$$13. \quad \overset{50}{\blacksquare} 3 \overline{)158}$$

$$14. \quad \overset{30}{\blacksquare} 7 \overline{)235}$$

$$15. \quad \overset{20}{\blacksquare} 6 \overline{)125}$$

$$16. \quad \overset{30}{\blacksquare} 5 \overline{)160}$$

$$17. \quad \overset{10}{\blacksquare} 3 \overline{)23}$$

$$18. \quad \overset{30}{\blacksquare} 7 \overline{)240}$$

$$19. \quad \overset{70 \text{ or } 80}{\blacksquare} 4 \overline{)300}$$

116 3-digit dividends



Using the Book Use the display to demonstrate how we use multiples of 10 to estimate an initial quotient. Discuss with children why the estimate $30 \times 5 = 150$ is a good choice. (The product 150 is the one that most closely approximates the dividend 164 without exceeding it.)

Some students may perceive that, if 150 is subtracted from 164, the apparent remainder is larger than the divisor which "breaks the rule" established on pages 113-114. Suggest that estimation with multiples of 10 is just the first step in a series of steps; therefore, the process is incomplete.

You may find it worthwhile to work co-operatively on Exercises 1-4. Use this opportunity to discuss again what constitutes a suitable estimate.

Note that students are not expected to complete the division process. The exercises are intended to provide practice with determining the initial estimate based on multiples of 10. Stress this and indicate that the answers to Exercises 6-8 which appear in the back of the text show the answer format.

Steps in Division

Estimate. 	Multiply. 	Subtract.
$\begin{array}{r} 20 \\ 3 \overline{)72} \\ \underline{60} \\ 12 \end{array}$ <p>Use multiples of 10.</p>	$\begin{array}{r} 20 \\ 3 \overline{)72} \\ \underline{60} \quad (3 \times 20) \end{array}$	$\begin{array}{r} 20 \\ 3 \overline{)72} \\ \underline{60} \\ 12 \end{array}$
$\begin{array}{r} 4 \\ 20 \\ 3 \overline{)72} \\ \underline{60} \\ 12 \end{array}$ <p>Use multiples of 1. $3 \times 4 = 12$</p>	$\begin{array}{r} 4 \\ 20 \\ 3 \overline{)72} \\ \underline{60} \\ 12 \end{array}$ <p>$12 \quad (3 \times 4)$</p>	$\begin{array}{r} 24 \text{ Quotient} \\ 3 \overline{)72} \\ \underline{60} \\ 12 \\ \underline{12} \\ 0 \end{array}$

Exercises

1. $2 \overline{)126} 63$ 2. $3 \overline{)111} 37$ 3. $4 \overline{)144} 36$ 4. $5 \overline{)125} 25$ 5. $2 \overline{)110} 55$
 6. $2 \overline{)150} 75$ 7. $3 \overline{)165} 55$ 8. $4 \overline{)128} 32$ 9. $5 \overline{)155} 31$ 10. $2 \overline{)190} 95$
 11. $3 \overline{)186} 62$ 12. $4 \overline{)180} 45$ 13. $5 \overline{)175} 35$ 14. $3 \overline{)192} 64$ 15. $4 \overline{)168} 42$
 16. $3 \overline{)216} 72$ 17. $4 \overline{)256} 64$ 18. $5 \overline{)360} 72$ 19. $4 \overline{)324} 81$ 20. $4 \overline{)376} 94$
 21. $2 \overline{)138} 69$ 22. $3 \overline{)102} 34$ 23. $3 \overline{)75} 25$ 24. $4 \overline{)104} 26$ 25. $7 \overline{)147} 21$
 26. $5 \overline{)210} 42$ 27. $6 \overline{)84} 14$ 28. $7 \overline{)98} 14$ 29. $9 \overline{)216} 24$ 30. $9 \overline{)459} 51$

Division algorithm, no remainder 117

Using the Book Again, go through the steps in the display together, as was done in the Initial Activity. Point out that the display shows the six steps in the process of finding the quotient of $3 \overline{)72}$. Be especially certain with the fourth stage, emphasizing that we are working with 3 and 12.

It would be worthwhile to work co-operatively on Exercises 1-3, discussing each step within a cycle. The answers for Exercises 1-7 are in the back of the book. Some children may need to check these to ensure they are on the right track.

OBJECTIVE

To divide with a 1-digit divisor to yield a 2-digit quotient with no remainder

PACING

Level A 1-20
Level B Odd-numbered exercises
Level C Even-numbered exercises

RELATED AIDS

BFA PROB. SOLVING LAB II — 58, 66, 175, 215.

SUGGESTIONS

Initial Activity The groundwork for this second step has been laid in the previous lesson. Use the chalkboard to demonstrate the first cycle (estimate, multiply, subtract) as shown in the display. After subtraction is completed ($72 - 60 = 12$), it becomes clear that we have a remainder which is greater than the divisor. The question "How many groups of 3 in 12?" leads directly to the second cycle. Discuss with students the reason for placing the "4" in the one's column. The quotient is found by adding the two "stacked" numbers ($20 + 4 = 24$).

ACTIVITIES

1. See the Fact Folder idea in the Activity Reservoir.

2. Prepare (have the children help) a series of "fill in the box" activity cards or sheets as shown to help reinforce the division stages noted in this lesson.

<input type="text"/>	<input type="text"/>	Quotient
<input type="text"/>	<input type="text"/>	
4	0	
$\overline{)168}$	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	

<input type="text"/>	<input type="text"/>	Quotient
<input type="text"/>	<input type="text"/>	
6	2	
$\overline{)252}$	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	
<input type="text"/>	<input type="text"/>	

EXTRA PRACTICE

See HMS — DM34.

OBJECTIVE

To check division by multiplication

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activity Review briefly the relationship between division and multiplication.

$$27 \div 3 = 9 \longrightarrow 9 \times 3 = 27$$

$$135 \div 5 = 27 \longrightarrow 27 \times 5 = 135$$

Use examples as shown in the display to demonstrate how this relationship provides us with a checking procedure for division.

ACTIVITIES

1. Prepare a set of cards of matching division and multiplication statements to play "Concentration". Have the students help, perhaps by using the exercises, when this page has been completed.

Example

$$\begin{array}{r} 16 \\ 6 \overline{) 96} \end{array}$$

$$\begin{array}{r} 16 \\ \times 6 \\ \hline 96 \end{array}$$

$$\begin{array}{r} 25 \\ 5 \overline{) 125} \end{array}$$

$$\begin{array}{r} 25 \\ \times 5 \\ \hline 125 \end{array}$$

$$\begin{array}{r} 73 \\ 3 \overline{) 219} \end{array}$$

$$\begin{array}{r} 73 \\ \times 3 \\ \hline 219 \end{array}$$

2. Some students enjoy investigating the Unitate Method for checking division.

Example

$$\begin{array}{r} 28 \\ 5 \overline{) 140} \\ \underline{10} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

- Sum the digits of the quotient to make a single-digit number.
 $28 \longrightarrow 2 + 8 = 10 \longrightarrow 1 + 0 = 1$
- Multiply this number by the divisor.
 $5 \times 1 = 5$
- Sum the digits of the dividend.
 $140 \longrightarrow 1 + 4 + 0 = 5$
- If the numbers in Steps 2 and 3 are the same, the division question is correct, e.g., $5 \longleftrightarrow 5$.

Checking Division

Chuck divided: $\begin{array}{r} 9 \\ 3 \overline{) 27} \\ \underline{27} \\ 0 \end{array}$ Check: $\begin{array}{r} 9 \\ \times 3 \\ \hline 27 \end{array}$

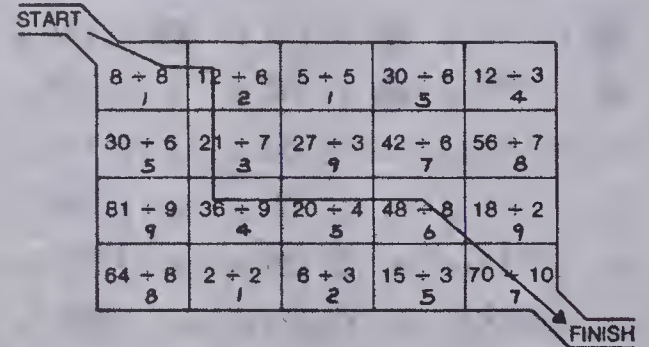
Mary divided: $\begin{array}{r} 27 \\ 7 \overline{) 135} \\ \underline{100} \\ 35 \\ \underline{35} \\ 0 \end{array}$ Check: $\begin{array}{r} 27 \\ \times 5 \\ \hline 135 \end{array}$

Exercises Divide. Check.

1. $6 \overline{) 96}$ 16 2. $5 \overline{) 125}$ 25 3. $3 \overline{) 219}$ 73 4. $4 \overline{) 184}$ 46 5. $2 \overline{) 164}$ 82
6. $7 \overline{) 154}$ 22 7. $8 \overline{) 96}$ 12 8. $9 \overline{) 108}$ 12 9. $7 \overline{) 91}$ 13 10. $6 \overline{) 204}$ 34
11. $8 \overline{) 368}$ 46 12. $9 \overline{) 468}$ 52 13. $6 \overline{) 456}$ 76 14. $7 \overline{) 644}$ 92 15. $9 \overline{) 666}$ 74

BRAINTICKLER

There is a secret path through this maze.
Find every quotient, then look for the path!



118 Checking division, no remainder

Using the Book Read through the display as a group showing how the information shown illustrates what was discussed in the Initial Activity. Assign the exercises.

If using the Braintickler, you may wish to duplicate the maze for distribution.

If a remainder occurs, add it to the number calculated in Step 2.

Example

$$\begin{array}{r} 29 \\ 5 \overline{) 147} \\ \underline{10} \\ 47 \\ \underline{45} \\ 2 \end{array}$$

- $29 \longrightarrow 2 + 9 = 11 \longrightarrow 1 + 1 = 2$
- (a) $5 \times 2 = 10 \longrightarrow 1 + 0 = 1$
(b) $2 + 1 = 3$
- $147 \longrightarrow 1 + 4 + 7 = 12 \longrightarrow 1 + 2 = 3$
- $3 \longleftrightarrow 3$

3. Some of your Level C students might enjoy making up activity cards using the challenges suggested by the Braintickler on this page.

Steps in Division

Let's look at Brenda's work.

$$\begin{array}{r} 20 \\ 6 \overline{)158} \\ - 120 \\ \hline 38 \end{array}$$

Steps

- (a) Estimate? 20
(b) $6 \times 20 = \blacksquare$ 120
(c) $158 - 120 = \blacksquare$ 38

$$\begin{array}{r} 26 \\ 6 \overline{)158} \\ - 120 \\ \hline 38 \\ - 36 \\ \hline 2 \end{array}$$

Steps

- (a) Second estimate? 6
(b) $6 \times 6 = \blacksquare$ 36
(c) $38 - 36 = \blacksquare$ 2
(d) $20 + 6 = \blacksquare$ 26
(e) Remainder? 2

Exercises

Find the quotient and remainder.

- | | | | | |
|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| ● $4 \overline{)137}^{34R1}$ | ● $3 \overline{)237}^{79R0}$ | ● $5 \overline{)170}^{34R0}$ | ● $3 \overline{)82}^{27R1}$ | ● $4 \overline{)92}^{23R0}$ |
| ● $5 \overline{)137}^{27R2}$ | ● $2 \overline{)119}^{59R1}$ | 8. $4 \overline{)213}^{53R1}$ | 9. $2 \overline{)148}^{74R0}$ | 10. $3 \overline{)125}^{41R2}$ |
| 11. $3 \overline{)164}^{54R2}$ | 12. $2 \overline{)137}^{68R1}$ | 13. $4 \overline{)249}^{62R1}$ | 14. $4 \overline{)167}^{41R3}$ | 15. $5 \overline{)156}^{31R1}$ |
| 16. $5 \overline{)258}^{51R3}$ | 17. $2 \overline{)113}^{56R1}$ | 18. $3 \overline{)226}^{75R1}$ | 19. $4 \overline{)129}^{32R1}$ | 20. $6 \overline{)247}^{41R1}$ |
| 21. $7 \overline{)295}^{42R1}$ | 22. $9 \overline{)289}^{32R1}$ | 23. $6 \overline{)266}^{44R2}$ | 24. $8 \overline{)253}^{31R5}$ | 25. $7 \overline{)359}^{51R2}$ |
| 26. $6 \overline{)429}^{71R3}$ | 27. $8 \overline{)409}^{51R1}$ | 28. $9 \overline{)647}^{71R8}$ | 29. $7 \overline{)577}^{82R3}$ | 30. $8 \overline{)666}^{83R2}$ |
| 31. $7 \overline{)289}^{41R2}$ | 32. $8 \overline{)444}^{55R4}$ | 33. $9 \overline{)555}^{61R6}$ | 34. $7 \overline{)333}^{47R4}$ | 35. $8 \overline{)777}^{97R1}$ |

Division algorithm, with remainders 119

OBJECTIVE

To divide with a 1-digit divisor to yield a 2-digit quotient with remainder

PACING

Level A 1-23
Level B 1-5, 16-32
Level C 1-5, 21-31

RELATED AIDS

BFA PROB. SOLVING LAB II — 59, 60, 70.
CALC. W/BK — 8.

BACKGROUND

This is the third lesson in a series of five dealing with the division algorithm.

SUGGESTIONS

Initial Activity Review the procedure as presented on page 117 (i.e., Estimate, Multiply, Subtract, etc.) using examples which have no remainder. Introduce one that does have a remainder and have someone go through the steps as before. Emphasize that (a) the process is the same, (b) the remainder simply indicates a "left over" and that all that is required is to write "R" beside it, and (c) we must be careful not to leave a remainder which is larger than the divisor.

ACTIVITIES

1. To reinforce the steps in division, prepare "fill in the box" cards or sheets as discussed on page 117, Activity 2.

2. When the exercises have been completed, have the students select five exercises and write a word statement explaining what the computation means.

Example

$$\begin{array}{r} 34R1 \\ 4 \overline{)137} \end{array}$$

"When 137 counters are divided up into groups of 4, there are 34 groups with 1 counter left over."

3. Some of the more imaginative students may be able to write more elaborate stories or word problems, especially if some basic ideas are presented to start them off.

Example

$$\begin{array}{r} 34R1 \\ 4 \overline{)137} \end{array}$$

, golfers, foursomes;

$$\begin{array}{r} 79 \\ 3 \overline{)237} \end{array}$$

, matchsticks, triangles;

$$\begin{array}{r} 34 \\ 5 \overline{)170} \end{array}$$

, pennies, nickels.

Using the Book Go through the display emphasizing what was discussed in the Initial Activity.

When students have completed Exercises 1-10, you or student volunteers might put the completed questions on the board. Discuss the steps taken in every case. In this way, student difficulties can be diagnosed. Assign from the balance of the exercises to meet the needs of the various groups in the class.

OBJECTIVE

To divide using the standard division algorithm

PACING

Level A 1-9, 15-29

Level B 1-4, even

Level C 1-4, odd

RELATED AIDS

HMS — DM34.

BACKGROUND

This fourth lesson in the series of five introduces students to the standard division algorithm.

SUGGESTIONS

Initial Activity Review by demonstrating the steps (as presented on the previous pages) involved in completing a division problem such as $136 \div 3$. Then read the question using the "short-form" method as illustrated in the display. Bring out the point that we no longer have to "stack" the quotient but simply place the digits side by side according to place value. We can omit the zero in 40 because we understand that the "4" means "4 groups of ten". The "5" is written in place of the zero to mean 5 ones. The remainder is indicated as shown.

ACTIVITIES

1. See the Fact Folder idea in the Activity Reservoir.

2. When the exercises have been completed and corrected, have the children help prepare some "fill in the blank" type exercises of the sort shown in Exercises 1-4. Be certain that the children use a \square instead of a \blacksquare so that the numbers may easily be written in.

3. Related to Activity 2 above, some children may prepare some cards with intentional errors for use in preparing a "Picking Peaches" game as described in the Activity Reservoir.

EXTRA PRACTICE

If you have not already done so, see HMS — DM34.

A Short Form for Division

Short Form

$$\begin{array}{r} 4 \\ 3 \overline{)136} \\ \underline{120} \\ 16 \end{array}$$

Estimate 40.
Write 4 in the
ten's place.

$$\begin{array}{r} 45 \\ 3 \overline{)136} \\ \underline{120} \\ 16 \\ \underline{15} \\ 1 \text{ R} \end{array}$$

Estimate 5.
Write 5 in the
one's place.
Show remainder.

Exercises

Help Sandy with these *short forms*. Copy and complete.

$$\begin{array}{r} 6 \blacksquare 5 \\ 2 \overline{)131} \\ \underline{120} \\ \blacksquare \blacksquare 11 \\ \blacksquare \blacksquare 10 \\ 1 \blacksquare \text{ R} \end{array}$$

$$\begin{array}{r} 7 \blacksquare 3 \\ 5 \overline{)368} \\ \underline{350} \\ \blacksquare \blacksquare 18 \\ \blacksquare \blacksquare 15 \\ 3 \blacksquare \text{ R} \end{array}$$

$$\begin{array}{r} 38 \\ 4 \overline{)153} \\ \underline{120} \\ \blacksquare \blacksquare 33 \\ \blacksquare \blacksquare 32 \\ 1 \blacksquare \text{ R} \end{array}$$

$$\begin{array}{r} \blacksquare \blacksquare 75 \\ 3 \overline{)225} \\ \underline{\blacksquare \blacksquare \blacksquare 210} \\ \blacksquare \blacksquare 15 \\ \blacksquare \blacksquare 15 \\ 0 \blacksquare \text{ R} \end{array}$$

$$\bullet \begin{array}{r} 82 \text{ R} 1 \\ 2 \overline{)165} \end{array}$$

$$\bullet \begin{array}{r} 48 \text{ R} 1 \\ 3 \overline{)145} \end{array}$$

$$\bullet \begin{array}{r} 71 \text{ R} 1 \\ 2 \overline{)143} \end{array}$$

$$\bullet \begin{array}{r} 45 \text{ R} 2 \\ 3 \overline{)137} \end{array}$$

$$9. \begin{array}{r} 43 \text{ R} 3 \\ 4 \overline{)175} \end{array}$$

$$10. \begin{array}{r} 33 \text{ R} 3 \\ 5 \overline{)168} \end{array}$$

$$11. \begin{array}{r} 28 \text{ R} 1 \\ 4 \overline{)113} \end{array}$$

$$12. \begin{array}{r} 48 \text{ R} 3 \\ 5 \overline{)243} \end{array}$$

$$13. \begin{array}{r} 29 \text{ R} 2 \\ 6 \overline{)176} \end{array}$$

$$14. \begin{array}{r} 55 \text{ R} 2 \\ 4 \overline{)222} \end{array}$$

$$15. \begin{array}{r} 35 \text{ R} 2 \\ 4 \overline{)142} \end{array}$$

$$16. \begin{array}{r} 37 \text{ R} 3 \\ 5 \overline{)188} \end{array}$$

$$17. \begin{array}{r} 30 \text{ R} 5 \\ 6 \overline{)185} \end{array}$$

$$18. \begin{array}{r} 48 \text{ R} 2 \\ 3 \overline{)146} \end{array}$$

$$19. \begin{array}{r} 41 \text{ R} 3 \\ 5 \overline{)208} \end{array}$$

$$20. \begin{array}{r} 73 \text{ R} 2 \\ 3 \overline{)221} \end{array}$$

$$21. \begin{array}{r} 56 \text{ R} 1 \\ 4 \overline{)225} \end{array}$$

$$22. \begin{array}{r} 44 \text{ R} 3 \\ 6 \overline{)267} \end{array}$$

$$23. \begin{array}{r} 46 \text{ R} 1 \\ 5 \overline{)231} \end{array}$$

$$24. \begin{array}{r} 38 \text{ R} 2 \\ 4 \overline{)154} \end{array}$$

$$25. \begin{array}{r} \$1.11 \\ 5 \overline{)\$5.55} \end{array}$$

$$26. \begin{array}{r} \$2.12 \\ 4 \overline{)\$8.48} \end{array}$$

$$27. \begin{array}{r} \$1.04 \\ 4 \overline{)\$4.16} \end{array}$$

$$28. \begin{array}{r} \$1.16 \\ 6 \overline{)\$6.96} \end{array}$$

$$29. \begin{array}{r} \$2.82 \\ 3 \overline{)\$8.46} \end{array}$$

120 Short form for division

Using the Book Discuss the display, emphasizing the same points as in the Initial Activity. You may wish to work co-operatively on Exercises 1-4, following the steps to discover the appropriate numbers for each \blacksquare . Discuss the procedure and any difficulties before assigning the exercises. Exercises 25-29 involve money and may require a simple caution to "remember the dollar sign and decimal place in the quotient." Keep in mind that the emphasis at this point is on the stages in the division process. If you are following the HMS sequence, division of decimals, money notation, and operations involving money will be formally handled later.

Practising the Short Form

253 "Chocolate Delights".
6 in each box.
How many boxes?
How many left over?



$$\begin{array}{r} 42 \\ 6 \overline{)253} \\ \underline{240} \\ 13 \\ \underline{12} \\ 1 \text{ R} \end{array}$$

What estimates were made?

There are $\overset{42}{\blacksquare}$ boxes of "Chocolate Delights" with $\overset{1}{\blacksquare}$ left over.

Exercises

Complete these short forms. Estimates are important.

- | | | |
|---|---|--|
| 1. $\overset{4 \blacksquare 6}{4 \overline{)187}}$
$\underline{160}$
27
$\blacksquare \blacksquare 24$
$3 \blacksquare \text{ R}$ | 2. $\overset{\blacksquare \blacksquare 43}{5 \overline{)216}}$
$\underline{200}$
16
$\blacksquare \blacksquare 15$
$1 \blacksquare \text{ R}$ | 3. $\overset{\blacksquare \blacksquare 45}{6 \overline{)273}}$
$\underline{240}$
$\blacksquare \blacksquare$
33
$\blacksquare \blacksquare 30$
$3 \blacksquare \text{ R}$ |
| 4. $\overset{87 \text{ R} 1}{2 \overline{)175}}$ | 5. $\overset{67 \text{ R} 3}{4 \overline{)271}}$ | 6. $\overset{54 \text{ R} 3}{4 \overline{)219}}$ |
| 7. $\overset{74 \text{ R} 4}{5 \overline{)374}}$ | 8. $\overset{33 \text{ R} 3}{7 \overline{)234}}$ | 9. $\overset{63 \text{ R} 1}{4 \overline{)253}}$ |
| 10. $\overset{86 \text{ R} 1}{2 \overline{)173}}$ | 11. $\overset{38 \text{ R} 2}{3 \overline{)116}}$ | 12. $\overset{22 \text{ R} 5}{6 \overline{)137}}$ |
| 13. $\overset{25 \text{ R} 1}{5 \overline{)126}}$ | 14. $\overset{53 \text{ R} 4}{6 \overline{)322}}$ | 15. $\overset{45 \text{ R} 6}{7 \overline{)321}}$ |
| 16. $\overset{74 \text{ R} 2}{3 \overline{)224}}$ | 17. $\overset{54 \text{ R} 3}{8 \overline{)435}}$ | 18. $\overset{42 \text{ R} 1}{9 \overline{)379}}$ |
| 19. $\overset{35 \text{ R} 6}{7 \overline{)251}}$ | 20. $\overset{39 \text{ R} 7}{8 \overline{)319}}$ | 21. $\overset{32 \text{ R} 8}{9 \overline{)296}}$ |
| 22. $\overset{52 \text{ R} 2}{7 \overline{)366}}$ | 23. $\overset{42 \text{ R} 1}{9 \overline{)379}}$ | 24. $\overset{\$1.14}{6 \overline{)\$6.84}}$ |
| 25. $\overset{\$0.55 \text{ R} 6}{7 \overline{)\$3.91}}$ | 26. $\overset{\$0.35}{9 \overline{)\$3.15}}$ | 27. $\overset{\$0.45}{8 \overline{)\$3.60}}$ |
| 28. $\overset{\$0.94}{5 \overline{)\$4.70}}$ | | |

Short form for division 121

OBJECTIVE

To practise division using the standard algorithm

PACING

Level A 1-20
Level B 1-2, 4-18
Level C 1, 14-28

RELATED AIDS

BFA COMP LAB II — 51.

SUGGESTIONS

Initial Activity This final lesson in the series of five provides further practice with the standard division algorithm. Use a problem similar to the one in the display to start the lesson.

ACTIVITIES

1. Some students might investigate how division is checked by multiplication when a remainder occurs.

Example

$\overset{31 \text{ R} 3}{6 \overline{)189}}$	\longrightarrow	$\begin{array}{r} 31 \text{ (Multiply)} \\ \times 6 \\ \hline 186 \text{ (Add remainder)} \\ + 3 \\ \hline 189 \end{array}$
---	-------------------	---

2. Some students might enjoy playing the game "Quad-Row" as described in the Activity Reservoir.

3. If you have not already done so, see the Activities section on the previous page.

Using the Book Those students who encounter difficulties might benefit from reteaching based on activities and suggestions presented on pages 116-117. As with page 120, some exercises (24-28) involve money. A simple caution to "remember the dollar sign and decimal place in the quotient" should suffice.

The emphasis at this point is on the stages in the division process. If you are following the HMS sequence, division of decimals, money notation, and operations involving money will be formally handled later.

OBJECTIVE

To divide multiples of 10, 100, 1000
by powers of 10

PACING

Level A 1-14

Level B 1-14

Level C 1-12, 15-17

RELATED AIDS

HMS — DM33.

BFA COMP LAB II — 52.

SUGGESTIONS

Initial Activity It would be appropriate to review multiplication by 1, 10, 100, 1000 (pages 79-80).

ACTIVITIES

1. When Exercises 1 and 2 have been completed and discussed, have children transcribe those (or similar) multiplication and division statements to index cards. Each card should contain only one statement. The deck of cards can then be shuffled and presented as a "Match the correct cards" activity.

2. Prepare and distribute a "Glue-a-True" activity as shown. Children are required to cut out the numbers, provide correct symbols, and produce true division statements of the type shown on this page (i.e., $2000 \div 1000 = 2$). Caution the students to (a) use all numbers and (b) be sure before they glue.

"Glue-a-True" Division Sentence

200

8000

5

100

10

500

100

1000

80

4000

4

4400

10

44 000

Use the numbers above to make 5 true division sentences.

3. If calculators are available, some children may enjoy exploring further patterns of the type shown in Exercises 1 and 2.

EXTRA PRACTICE

If you have not already done so, see HMS — DM33.

Other Special Numbers in Division

50 boxes of Crunchies
on the shelf in 10 rows.

How many boxes in each row?

$$50 \div 10 = \blacksquare 5$$

5

There are \blacksquare boxes in each row.

Use multiplication to help.

$$10 \times \blacksquare = 50$$

$$10 \times 5 = 50$$

Exercises

Complete the charts.

1. Since I know:	Then I know:
$10 \times 3 = 30$	$30 \div 10 = 3$
$100 \times 6 = 600$	$600 \div 100 = 6$
$1000 \times 8 = 8000$	$8000 \div 1000 = 8$
$10 \times 50 = 500$	$500 \div 10 = 50$
$100 \times 90 = 9000$	$9000 \div 100 = 90$
$1000 \times 3 = 3000$	$3000 \div 1000 = 3$

2. Solve:	Use:
$70 \div 10 = \blacksquare$	$10 \times \blacksquare = 70$
$600 \div 10 = \blacksquare$	$10 \times \blacksquare = 600$
$400 \div 100 = \blacksquare$	$100 \times \blacksquare = 400$
$2000 \div 100 = \blacksquare$	$100 \times \blacksquare = 2000$
$6000 \div 1000 = \blacksquare$	$1000 \times \blacksquare = 6000$
$7000 \div 10 = \blacksquare$	$10 \times \blacksquare = 7000$

Find the quotients.

● $3000 \div 100 = 30$

● $2000 \div 1000 = 2$

● $800 \div 10 = 80$

6. $500 \div 100 = 5$

7. $40 \div 10 = 4$

8. $4000 \div 1000 = 4$

9. $2000 \div 10 = 200$

10. $8000 \div 100 = 80$

11. $900 \div 10 = 90$

12. $600 \div 10 = 60$

13. $7000 \div 100 = 70$

14. $5000 \div 10 = 500$

15. $300 \div 100 = 3$

★ 16. $44\ 000 \div 100 = 440$

★ 17. $41\ 200 \div 100 = 412$

122 Dividing by powers of ten

Using the Book If Exercises 1 and 2 are assigned for independent work, correct these exercises before assigning the others.

Some students may develop "short cuts" as they work through Exercises 3-17.

Example

"Remove the same number of zeros from each number."

$$\begin{aligned} 3000 \div 100 &= 3000 \div 100 \\ &= 30 \div 1 \\ &= 30 \end{aligned}$$

Encourage these students to check the quotient by multiplication, e.g., $30 \times 100 = 3000$.

Be certain that the children are familiar with the accepted answer format before writing their responses in their workbooks.

Division with Zero

3 goldfish bowls.
No goldfish altogether.
How many goldfish in each bowl?
There are $\frac{0}{3}$ goldfish in each bowl.



$$0 \div 3 = 0$$

What is the quotient when zero is divided by any number?

$$\begin{array}{ll} 0 \times 1 = 0 & 0 \div 1 = 0 \\ 0 \times 2 = 0 & 0 \div 2 = 0 \\ 0 \times 10 = 0 & 0 \div 10 = 0 \end{array}$$

We cannot divide by zero!

$$\begin{array}{l} 2 \times 0 = 2 \text{ has no solution.} \\ 2 \div 0 = \text{ has no solution.} \end{array}$$

When zero is divided by any number (except 0), the quotient is zero.

We cannot divide by zero.
 $5 \div 0$ has no answer.

Exercises

Solve where possible.

1. $0 \times 1 = 0$	2. $7 \div 0 = \text{No solution.}$	3. $6 \times 0 = 0$	4. $0 \div 3 = 0$
5. $14 \div 0 = \text{No solution.}$	6. $12 \div 3 = 4$	7. $0 \times 9 = 0$	8. $0 \div 16 = 0$
9. $3 \times 8 = 24$	10. $7 \times 9 = 63$	11. $54 \div 6 = 9$	12. $12 \div 0 = \text{No solution.}$
13. $8 \times 0 = 0$	14. $0 \div 9 = 0$	15. $16 \div 0 = \text{No solution.}$	16. $0 \div 25 = 0$
17. $9 \times 9 = 81$	18. $8 \times 8 = 64$	19. $7 \times 9 = 63$	20. $54 \div 9 = 6$

Zero in division 123

OBJECTIVE

To establish and use rules for:

- division of zero by a whole number
- division of a whole number by zero

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activity To introduce this lesson, review the idea that we can find missing quotients by finding missing factors.

Example

$3 \times 6 = 18$ $18 \div 6 = 3$
If this concept has been well established, proceed directly to the examples in the display.

ACTIVITIES

1. Some students may wish to explore division by zero through number patterns.

Example

If $6 \div 6 = 1$ then $6 \times 1 = 6$.
If $6 \div 3 = 2$ then $2 \times 3 = 6$.
If $6 \div 2 = 3$ then $3 \times 2 = 6$.
If $6 \div 1 = 6$ then $6 \times 1 = 6$.

Now, consider the following:

$6 \div 0 \neq 6$ because $6 \times 0 \neq 6$.
 $6 \div 0 \neq 0$ because $0 \times 0 \neq 6$.
 $6 \div 0 \neq 1$ because $1 \times 0 \neq 6$.

2. See the "Flash" idea in the Activity Reservoir.

3. Have the children write their own "Solve where possible" problems on index cards for use as flash cards or as the basis for creating "zero" word problems.

Using the Book This lesson could be developed as a class discussion, or you may prefer to have students work through the exercises independently.

It is important that pupils understand the reasoning behind the two relationships:

- The only factor that will make the expression $\square \times 5 = 0$ true is zero, therefore it must be true of the inverse expression $0 \div 5 = 0$.
- There is no factor that will make the expression $\square \times 0 = 5$ true, therefore it must be true of the inverse expression $5 \div 0 = \text{no answer}$.

OBJECTIVE

To practise multiplication and division

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS — DM19, DM24, DM26, and DM34.

BFA PROB. SOLVING LAB II — 64, 67-69, 73, 177, 178, 217.

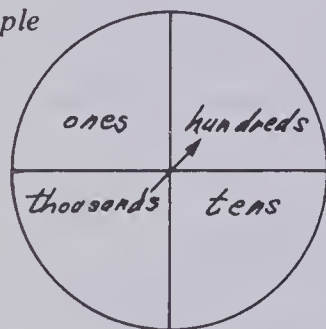
CALC. W/BK — 11.

ACTIVITIES

1. See "Marathon" as described in the Activity Reservoir.

2. Have the children copy (or use similar) exercises from page 124 onto index cards (one exercise per card) to produce a deck of 30 cards. Players (2-4) must: (a) twirl the spinner (shown); (b) select a card from the shuffled deck; (c) copy and compute the exercise; and (d) if correct, score the number of points equal to the number in the place-value location indicated by the spinner (if applicable). Players take turns till someone scores 25 or more points.

Example



Select a card, compute, and score 9 points.

$$\begin{array}{r} 135 \\ \times 7 \\ \hline 945 \end{array}$$

3. When the exercises on both pages have been completed and corrected, have some children copy them onto index cards for use in playing "Picking Peaches" as described in the Activity Reservoir.

Welcome to the Multiplication Olympics

Each correct answer is worth 1 point!



Multiplication Sprint!

1. 5×3 15	2. 4×7 28	3. 5×9 45	4. 3×6 18	5. 8×4 32
6. $\begin{array}{r} 3 \\ \times 2 \\ \hline 6 \end{array}$	7. $\begin{array}{r} 9 \\ \times 4 \\ \hline 36 \end{array}$	8. $\begin{array}{r} 7 \\ \times 3 \\ \hline 21 \end{array}$	9. $\begin{array}{r} 8 \\ \times 5 \\ \hline 40 \end{array}$	10. $\begin{array}{r} 7 \\ \times 6 \\ \hline 42 \end{array}$
11. 5×5 25	12. $\begin{array}{r} 9 \\ \times 6 \\ \hline 54 \end{array}$	13. 4×6 24	14. $\begin{array}{r} 9 \\ \times 3 \\ \hline 27 \end{array}$	15. 8×8 64

Multiplication High Jump!

1. $\begin{array}{r} 28 \\ \times 2 \\ \hline 56 \end{array}$	2. $\begin{array}{r} 35 \\ \times 5 \\ \hline 175 \end{array}$	3. $\begin{array}{r} 24 \\ \times 3 \\ \hline 72 \end{array}$	4. $\begin{array}{r} 77 \\ \times 6 \\ \hline 462 \end{array}$	5. $\begin{array}{r} 53 \\ \times 4 \\ \hline 212 \end{array}$
6. $\begin{array}{r} 357 \\ \times 2 \\ \hline 714 \end{array}$	7. $\begin{array}{r} 428 \\ \times 4 \\ \hline 1712 \end{array}$	8. $\begin{array}{r} 568 \\ \times 3 \\ \hline 1704 \end{array}$	9. $\begin{array}{r} 217 \\ \times 8 \\ \hline 1736 \end{array}$	10. $\begin{array}{r} 453 \\ \times 5 \\ \hline 2265 \end{array}$
11. $\begin{array}{r} 36 \\ \times 3 \\ \hline 108 \end{array}$	12. $\begin{array}{r} 337 \\ \times 5 \\ \hline 1685 \end{array}$	13. $\begin{array}{r} 64 \\ \times 9 \\ \hline 576 \end{array}$	14. $\begin{array}{r} 135 \\ \times 7 \\ \hline 945 \end{array}$	15. $\begin{array}{r} 52 \\ \times 8 \\ \hline 416 \end{array}$

124 Multiplication practice

Using the Book These pages attempt to review and provide practice in the multiplication and division skills developed to date. Consider the following suggestions before assigning the pages.

- Format** The Olympic format attempts to provide some purpose for computation. While students will want to know their "standing" in relation to classmates, stress the self-competitive aspect of the exercise.
- Selection** If you intend to have students write "compete" in all "events" (i.e., all sets), assign over a number of days.
- Achievement** Equivalent percents are listed in the charts below:

Page 124

Points	Percents
14-15	93-100%
12-13	80-86%
10-11	66-73%

Page 125

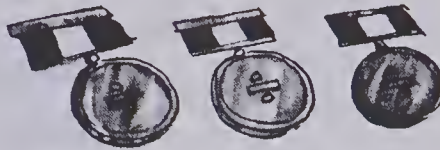
Points	Percents
22-25	88-100%
19-21	76-84%
16-18	64-72%

4. **Diagnosis** Students who do not achieve a suitable standard may require further practice, or reteaching may be necessary. Examine each set to discover weaknesses in basic facts, place value, regrouping, etc.

5. **Time** Rather than placing a time limit on each set, you might consider having students record their own times. Encourage students to strive for a combination of speed and accuracy.

Welcome to the Division Olympics

Each correct answer is worth 1 point!



Medals for each event.

Gold Medal	22-25 points
Silver Medal	19-21 points
Bronze Medal	16-18 points

Division Dash!

1. $18 \div 3$ 6 2. $30 \div 5$ 6 3. $56 \div 7$ 8 4. $32 \div 8$ 4 5. $16 \div 2$ 8
6. $3 \overline{)27}$ 9 7. $2 \overline{)8}$ 4 8. $6 \overline{)42}$ 7 9. $5 \overline{)40}$ 8 10. $9 \overline{)45}$ 5
11. $21 \div 7$ 3 12. $4 \overline{)28}$ 7 13. $36 \div 6$ 6 14. $7 \overline{)49}$ 7 15. $24 \div 3$ 8
16. $4 \overline{)32}$ 8 17. $7 \overline{)28}$ 4 18. $30 \div 5$ 6 19. $3 \overline{)30}$ 10 20. $30 \div 6$ 5
21. $56 \div 8$ 7 22. $5 \overline{)35}$ 7 23. $24 \div 4$ 6 24. $8 \overline{)64}$ 8 25. $60 \div 6$ 10

Division Long Distance Run! Some have remainders!

1. $\begin{array}{r} 26 \\ 2 \overline{)52} \end{array}$ 2. $\begin{array}{r} 16 \\ 3 \overline{)48} \end{array}$ 3. $\begin{array}{r} 12 R3 \\ 5 \overline{)63} \end{array}$ 4. $\begin{array}{r} 17 R1 \\ 3 \overline{)52} \end{array}$ 5. $\begin{array}{r} 14 \\ 6 \overline{)84} \end{array}$
6. $\begin{array}{r} 19 R3 \\ 6 \overline{)117} \end{array}$ 7. $\begin{array}{r} 25 R4 \\ 5 \overline{)129} \end{array}$ 8. $\begin{array}{r} 26 \\ 6 \overline{)156} \end{array}$ 9. $\begin{array}{r} 37 \\ 4 \overline{)148} \end{array}$ 10. $\begin{array}{r} 23 R3 \\ 6 \overline{)141} \end{array}$
11. $\begin{array}{r} 13 \\ 7 \overline{)91} \end{array}$ 12. $\begin{array}{r} 28 R2 \\ 4 \overline{)114} \end{array}$ 13. $\begin{array}{r} 11 R2 \\ 5 \overline{)57} \end{array}$ 14. $\begin{array}{r} 23 \\ 8 \overline{)184} \end{array}$ 15. $\begin{array}{r} 24 \\ 3 \overline{)72} \end{array}$
16. $\begin{array}{r} 35 \\ 5 \overline{)175} \end{array}$ 17. $\begin{array}{r} 46 R1 \\ 3 \overline{)139} \end{array}$ 18. $\begin{array}{r} 23 R5 \\ 7 \overline{)166} \end{array}$ 19. $\begin{array}{r} 32 \\ 4 \overline{)128} \end{array}$ 20. $\begin{array}{r} 30 \\ 6 \overline{)180} \end{array}$
21. $\begin{array}{r} 21 R2 \\ 7 \overline{)149} \end{array}$ 22. $\begin{array}{r} 37 R3 \\ 4 \overline{)151} \end{array}$ 23. $\begin{array}{r} 27 \\ 5 \overline{)135} \end{array}$ 24. $\begin{array}{r} 26 R1 \\ 6 \overline{)157} \end{array}$ 25. $\begin{array}{r} 63 \\ 3 \overline{)189} \end{array}$

EXTRA PRACTICE

If you have not already done so, see HMS — DM34.

OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS — DM35.

Chapter Test

1. Write two division sentences for each multiplication sentence.

(a) $3 \times 4 = 12$ $\begin{matrix} \nearrow 12 \div 4 = 3 \\ \searrow 12 \div 3 = 4 \end{matrix}$ (b) $7 \times 5 = 35$ $\begin{matrix} \nearrow 35 \div 5 = 7 \\ \searrow 35 \div 7 = 5 \end{matrix}$

2. Divide.

(a) $18 \div 18$ 1 (b) $25 \div 1$ 25 (c) $72 \div 8$ 9 (d) $0 \div 18$ 0

3. Divide. Some have remainders.

(a) $37 \div 5$ $\begin{matrix} 7R2 \\ 5 \overline{)37} \end{matrix}$ (b) $29 \div 7$ $\begin{matrix} 4R1 \\ 7 \overline{)29} \end{matrix}$ (c) $33 \div 6$ $\begin{matrix} 5R3 \\ 6 \overline{)33} \end{matrix}$ (d) $19 \div 4$ $\begin{matrix} 4R3 \\ 4 \overline{)19} \end{matrix}$ (e) $3000 \div 10$ $\begin{matrix} 300 \\ 10 \overline{)3000} \end{matrix}$

(f) $5 \overline{)450}$ $\begin{matrix} 90 \\ 5 \overline{)450} \end{matrix}$ (g) $4 \overline{)120}$ $\begin{matrix} 30 \\ 4 \overline{)120} \end{matrix}$ (h) $9 \overline{)270}$ $\begin{matrix} 30 \\ 9 \overline{)270} \end{matrix}$ (i) $100 \overline{)500}$ $\begin{matrix} 5 \\ 100 \overline{)500} \end{matrix}$ (j) $8 \overline{)240}$ $\begin{matrix} 30 \\ 8 \overline{)240} \end{matrix}$

(k) $700 \div 10$ $\begin{matrix} 70 \\ 10 \overline{)700} \end{matrix}$ (l) $8000 \div 100$ $\begin{matrix} 80 \\ 100 \overline{)8000} \end{matrix}$ (m) $700 \div 10$ $\begin{matrix} 70 \\ 10 \overline{)700} \end{matrix}$ (n) $9000 \div 10$ $\begin{matrix} 900 \\ 10 \overline{)9000} \end{matrix}$

4. Divide. Use the short form.

(a) $7 \overline{)236}$ $\begin{matrix} 33R5 \\ 7 \overline{)236} \end{matrix}$ (b) $3 \overline{)252}$ $\begin{matrix} 84 \\ 3 \overline{)252} \end{matrix}$ (c) $5 \overline{)425}$ $\begin{matrix} 85 \\ 5 \overline{)425} \end{matrix}$ (d) $6 \overline{)375}$ $\begin{matrix} 62R3 \\ 6 \overline{)375} \end{matrix}$ (e) $8 \overline{)336}$ $\begin{matrix} 42 \\ 8 \overline{)336} \end{matrix}$

(f) $9 \overline{)743}$ $\begin{matrix} 82R5 \\ 9 \overline{)743} \end{matrix}$ (g) $4 \overline{)311}$ $\begin{matrix} 77R3 \\ 4 \overline{)311} \end{matrix}$ (h) $5 \overline{)365}$ $\begin{matrix} 73 \\ 5 \overline{)365} \end{matrix}$ (i) $5 \overline{)654}$ $\begin{matrix} 130R4 \\ 5 \overline{)654} \end{matrix}$ (j) $7 \overline{)\$7.84}$ $\begin{matrix} \$1.12 \\ 7 \overline{)\$7.84} \end{matrix}$

5. Solve.

(a) 300 jars of Softy skin cream.
10 rows of jars.
How many jars in each row? 30

(b) 314 tubes of Bright toothpaste.
Room for 6 rows.
How many tubes in each row? 52
How many left over? 2

126 Chapter 4 test

Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 100).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1	A	102
2, 3, 4	B	120, 121
5	C	111, 112

Cumulative Review

1. Start:



Trace the seventh shape.



2. Add.

(a) $54 + 23$ (b) $235 + 48$ (c) $77 + 196$ (d) $3 + (7 + 5) = \blacksquare$

(e)
$$\begin{array}{r} 5 \\ 6 \\ + 7 \\ \hline 18 \end{array}$$
 (f)
$$\begin{array}{r} 187 \\ + 412 \\ \hline 599 \end{array}$$
 (g)
$$\begin{array}{r} 2014 \\ + 3045 \\ \hline 5059 \end{array}$$
 (h)
$$\begin{array}{r} 45\ 863 \\ + 16\ 972 \\ \hline 62\ 835 \end{array}$$

3. Subtract.

(a)
$$\begin{array}{r} 16 \\ - 8 \\ \hline 8 \end{array}$$
 (b)
$$\begin{array}{r} 23 \\ - 8 \\ \hline 15 \end{array}$$
 (c)
$$\begin{array}{r} 83 \\ - 43 \\ \hline 40 \end{array}$$
 (d)
$$\begin{array}{r} 601 \\ - 254 \\ \hline 347 \end{array}$$
 (e)
$$\begin{array}{r} 30\ 460 \\ - 15\ 945 \\ \hline 14\ 515 \end{array}$$

4. How many in the ten's place? 2345

5. Use $>$, $=$, or $<$.

$5234 \bullet 5311 <$

6. Rewrite using our numerals.

(a) XXII 22 (b) CL 150

7. Use a ruler to measure in millimetres.



8. Multiply.

(a)
$$\begin{array}{r} 387 \\ \times 7 \\ \hline 2709 \end{array}$$
 (b)
$$\begin{array}{r} 454 \\ \times 8 \\ \hline 3632 \end{array}$$

9. Divide.

(a)
$$\begin{array}{r} 76 \\ 6 \overline{)456} \end{array}$$
 (b)
$$\begin{array}{r} 96\ R3 \\ 8 \overline{)771} \end{array}$$

OBJECTIVE

To review and test selected concepts and skills previously covered

PACING

Level A All
Level B All
Level C All

Chapters 1-4 cumulative review 127

Using the Book This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1	4
2(a)	6
2(b), 2(c)	19
2(d), 2(e)	13
2(f)	17
2(g)	38
2(h)	39
3(a), 3(b)	5
3(c)	21
3(d)	27
3(e)	43
4	33
5	36
6	56
7	49
8	95
9	120

CHAPTER 5 OVERVIEW

This chapter introduces the basic concept of a fraction with emphasis on tenths. It introduces decimal notation and the addition and subtraction of decimal numbers including money. The decimetre and metre are reviewed.

OBJECTIVES

- A To introduce the concept of a fraction; to recognize and write equivalent fractions; to compare fractions
- B To write ones and tenths using decimal notation and compare decimal numbers using $>$, $=$, and $<$
- C To measure using decimetre and metre rulers marked in decimal parts
- D To add and subtract ones and tenths in decimal form
- E To use decimal notation to write dollars and cents and make change for amounts up to \$10
- F To add and subtract dollars and cents

BACKGROUND

The initial development of fractions relies heavily on concrete materials in order to give children the opportunity to conceptualize the meaning of fractions.

Provide the children with as many opportunities as possible that involve the separation and joining of parts in relation to the whole. The operations of addition and subtraction with fractions are introduced in Chapter 8.

An emphasis has been placed on tenths as background for the development of decimal numbers. The "tenth" relationship between the decimetre and metre helps emphasize the decimal number system.

The method of counting from the purchase price to the amount paid is used for making change.

Students should be provided with opportunities to make change using play money.

MATERIALS

paper for folding and making cutouts
fraction wheel (see page 130)
diagrams of shapes with halves, thirds, quarters marked
rulers
rods or straws
play money

CAREER AWARENESS

Hamburger Stand Operator [157]

The hamburger stand operator is responsible for the cooking and preparation of food and the selling of goods. Some operators would also be responsible for ordering supplies. These responsibilities demand arithmetic skills in making change quickly and accurately, in keeping accurate records of goods on hand and of total sales, and in checking bills for goods received.

The job requires patience, a pleasant manner in dealing with the public, and the ability to work unsupervised.

The operator must be able to plan and organize during daily slow periods for the heavy peak periods during which there may be long lines of people. Operators must work in an organized way to keep orders straight and to avoid mix-ups. The operator must be neat and meticulous in order to meet the standards established by various departments of health.

The working hours are unusual in that it is either shift work or long daily hours over a short workweek. A hamburger stand usually opens mid to late morning and closes late in the evening.

Fractions

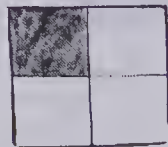
Fractions tell us about parts of things.

Fold a sheet
of paper.

Fold again.

Open.

Colour one
part blue.



$\frac{1}{4}$ is blue.
(numerator)
(denominator)

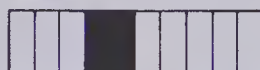
Exercises

Write a fraction to tell what part is coloured.

1. How many blue parts? \rightarrow $\frac{1}{5}$ is blue.
How many equal parts? \rightarrow $\frac{1}{5}$



2. How many red parts? \rightarrow $\frac{2}{10}$ is red.
How many equal parts? \rightarrow $\frac{2}{10}$



5.



6.



Write the fraction for each name.

7. two thirds $\frac{2}{3}$ 8. one fourth $\frac{1}{4}$ 9. three fifths $\frac{3}{5}$ 10. five eighths $\frac{5}{8}$

Name the numerator and the denominator in each fraction.

1. $\frac{3}{4}$ - numerator 12. $\frac{1}{6}$ - numerator
4 - denominator 6 - denominator
13. $\frac{3}{10}$ - numerator 14. $\frac{7}{8}$ - numerator
10 - denominator 8 - denominator

Concept of a fraction 129

Using the Book Provide the opportunity for students to do the activity described in the display. Emphasize that the numerator tells the number of parts to be used or coloured and that the denominator tells the number of parts in the whole. Numerators are read as cardinal numbers (one, two, three, ...) while denominators with the exception of 2 are read as ordinals (third, fourth, fifth, ...).

OBJECTIVE

To introduce the concept of a fraction

PACING

Level A All
Level B All
Level C All

VOCABULARY

numerator, denominator

MATERIALS

paper for folding

SUGGESTIONS

Initial Activity Begin the lesson with a discussion on common sayings or expressions involving fractions that the students may have heard (the third quarter, half time, one third off, and so forth). Direct the discussion at this point so that students realize that a fraction is less than one whole.

ACTIVITIES

1. Make fraction cards for students to answer.

(a) My numerator is 3 less than my denominator. My denominator is an odd number > 5 and < 9 . Who am I? ($\frac{4}{7}$)

(b) My numerator is one half my denominator and is between 2 and 6. My denominator is a multiple of 5. Who am I? ($\frac{5}{10}$)

2. Have students make fraction cards for other students to answer.

3. Make a set of flash cards showing numerically: $\frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}$, etc. (These cards form the basis of numerous activities which will be suggested over the next several pages.) Form teams showing each team a card in turn. The team members take turns saying the name of the fraction. The team with the most correct names in a previously allotted period of time is the winner.

OBJECTIVE

To recognize equivalence among halves, thirds, quarters, fifths, sixths, and tenths

PACING

Level A All
Level B All
Level C All

MATERIALS

fraction wheels (made from paper plates) cut into the various pieces mentioned in Objective above

RELATED AIDS

BFA COMP LAB II—60.

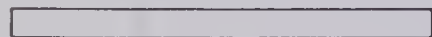
SUGGESTIONS

Initial Activity Using the fraction wheels, fit a $\frac{1}{2}$ piece into a "whole" plate, then fit tenths in until just the $\frac{1}{2}$ piece is covered. Explain that equivalent fractions are fractions that name the same amount. Show that $\frac{1}{2}$ and $\frac{5}{10}$ are the same amount or "equivalent". Say: "Brian ate this much. (Show $\frac{1}{2}$.) Shawna ate this much. (Show $\frac{5}{10}$.) Who ate the most?" Emphasize that they ate equal amounts. Repeat to show that $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{5}{10}$ and that $\frac{1}{3} = \frac{2}{6}$.

ACTIVITIES

1. Allow children to use fraction wheels as described in the Initial Activity for this lesson. They may work in twos or small groups, each person making a display, the others writing a fraction statement to describe that display.

2. Show students how to fold paper strips (use the same length for each folding so a comparison is possible) to make halves, fourths, and eighths; thirds and sixths.



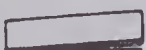
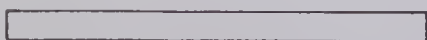
halves



fourths



eighths



thirds

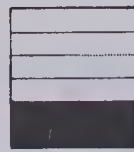


sixths

Naming Fractions



$\frac{1}{3}$ of the region is shaded.



$\frac{2}{6}$ of the region is shaded.

$\frac{1}{3}$ and $\frac{2}{6}$ represent the same amount.

$$\frac{1}{3} = \frac{2}{6}$$

Exercises

1.



$$\frac{2}{3} =$$



How many parts shaded? ■ 4

How many parts altogether? ▲ 6

Is the shaded portion the same in both? yes

$$\frac{2}{3} = \frac{4}{6}$$

2.



$$=$$



Fraction shaded

Fraction shaded

$$\frac{1}{2} = \frac{3}{6}$$

3.



$$=$$

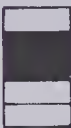


Fraction shaded

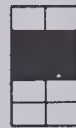
Fraction shaded

$$\frac{1}{2} = \frac{2}{4}$$

4.



$$=$$



$$\frac{2}{5} = \frac{4}{10}$$

5.



$$=$$



$$\frac{2}{5} = \frac{4}{10}$$

6.



$$=$$



$$\frac{1}{2} = \frac{5}{10}$$

130 Equivalent fractions

Using the Book Discuss the display. Emphasize that the region cut into 3 equal pieces is the same size as the region cut into 6 pieces. Point out that the same amount of each picture is shaded.

Complete Exercise 1 orally. Assign Exercises 2-6.

Students can colour the unfolded strips to show the various fractions. Ask the students to show which fractions are equivalent.

3. Make a set of picture cards showing all the fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, etc., up to $\frac{9}{10}$. (Omit the sevenths.) These cards form the basis of numerous games which will be suggested over the next several pages. Here, the students are to match the cards showing equivalent fractions:



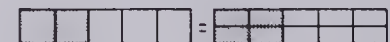
$$\left(\text{i.e., } \frac{1}{2} = \frac{3}{6} \right)$$

4. Use the set of flash cards from Activity 3, page 129, and the set of picture cards from Activity 3 above. Two or more students can play "Snap". The player with the most equivalent fractions wins.

EXTRA PRACTICE

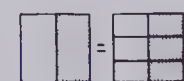
1. Write a pair of equivalent fractions represented.

(a)



$$\frac{2}{4} = \frac{1}{2}$$

(b)



$$\frac{3}{6} = \frac{1}{2}$$

(c)



$$\frac{2}{4} = \frac{1}{2}$$

2. Ask the students to complete these. Use the fraction wheels if necessary.

(a) $\frac{1}{2} = \frac{2}{4}$

(b) $\frac{1}{2} = \frac{3}{6}$

(c) $\frac{1}{2} = \frac{5}{10}$

(d) $\frac{1}{2} = \frac{4}{8}$

(e) $\frac{1}{3} = \frac{2}{6}$

(f) $\frac{2}{3} = \frac{4}{6}$

(g) $\frac{1}{4} = \frac{2}{8}$

(h) $\frac{2}{4} = \frac{4}{8}$

(i) $\frac{3}{4} = \frac{6}{8}$

(j) $\frac{1}{5} = \frac{2}{10}$

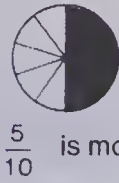
(k) $\frac{2}{5} = \frac{4}{10}$

(l) $\frac{3}{5} = \frac{6}{10}$

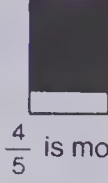
(m) $\frac{4}{5} = \frac{8}{10}$

More, Less, or the Same?

Which shows more shaded area?



is more.



is more.

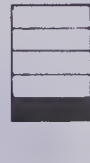
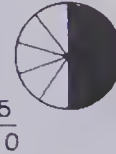


> means **more than**.
< means **less than**.
= means **equal**.

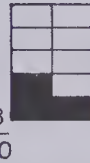
Use these symbols for each pair.



>



<



=



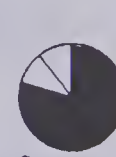
Exercises Use >, =, and < to compare the shaded parts.



<



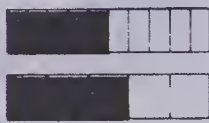
=



>



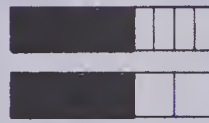
4.



<

$\frac{3}{5}$

5.



=

$\frac{3}{5}$

6.



>

$\frac{4}{10}$

Comparing fractions 131

OBJECTIVE

To use >, =, < for pairs of pictures showing fifths and tenths

PACING

Level A All
Level B All
Level C All

MATERIALS

fraction wheel (page 130)

RELATED AIDS

HMS — DM36.

SUGGESTIONS

Initial Activity Review the meaning of each of the symbols >, =, and <.

You may use the fraction wheel to establish which of two fractions is the larger in much the same way as we demonstrated equivalent fractions on page 130.

Display two wheels, one with two fifths and one with five tenths. Ask which is larger. Then write the two fractions on the chalkboard.

$$\frac{2}{5} \quad \frac{5}{10}$$

Demonstrate which sign goes between the two fractions to make a true statement.

Using the Book Discuss the top half of the page. You may wish to have students show these fractions using the fraction wheels or flannel board. This may help the students to "mentally" picture the fifths as tenths.

Then compare the fraction by counting the shaded areas. Assign Exercises 1-6. Be certain that the students know how to respond in their workbooks or on answer sheets.

ACTIVITIES

1. Challenge the students to draw pictures representing $\frac{1}{2}$, $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{1}{3}$, $\frac{2}{3}$ of a whole as shaded, i.e.,



or



For help they may refer to the paper folding in Activity 2, page 130.

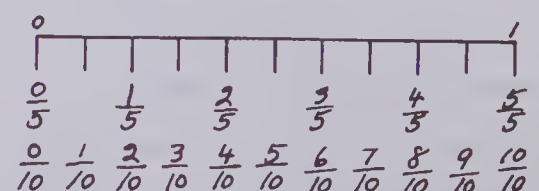
2. Use the cards described in Activity 3, page 129, to play "Fraction Action" (2-5 players). Include in the deck 7 or 8 cards of each of these symbols: =, >, <. Deal 4 cards per

player. Players take turns exchanging cards in hand for the top card of either the deck (face down) or the discard pile (face up). Play continues till a player on his/her turn can use three cards to make a true statement (i.e., $\frac{1}{2} > \frac{2}{5}$).

That player wins that round, receives a score equal to the denominator of the unused card held in hand. Overall winner is the first to reach a total of 25 points.

3. Play "Dominoes" as described in the Activity Reservoir.

4. Students can make a fraction number line comparing fifths and tenths.



EXTRA PRACTICE

HMS — DM36.

OBJECTIVE

To write tenths using decimal notation

PACING

Level A All
Level B All
Level C All

VOCABULARY

renaming, decimal

RELATED AIDS

HMS — DM37 and DM38.

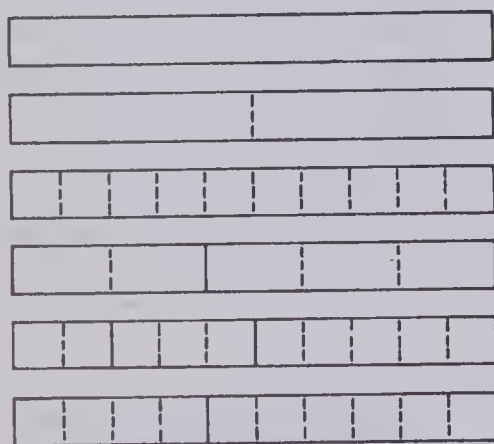
SUGGESTIONS

Initial Activity Ask students to give other names for items such as car (automobile), wiener (frankfurter), paste (glue), runner (shoe), etc. Make a list of these, explaining that we sometimes use different ways of naming things.

Discuss different names for the same number. For example 3, three, $2 + 1$, $5 - 2$, etc. all name the number 3. Then draw a diagram on the board showing one tenth and write the name $\frac{1}{10}$ to describe the diagram. Explain that there is also another way of naming $\frac{1}{10}$ and that is 0.1, which can also be read "zero decimal one" or "zero point one". Repeat for other tenths. Have each fraction identified and written 2 ways.

ACTIVITIES

1. Make sets of Fraction Bars as shown (or use DM37). Cut the bars along solid lines, fold along dotted lines.



Use the bars as manipulatives for such topics as:

Naming Fractions or Decimals — e.g., Show me $\frac{1}{5}$, zero decimal 2, . . .

Comparing Fractions or Decimals — Which is greater, $\frac{1}{5}$ or $\frac{1}{10}$?

Equivalence — How many tenths equal one half?

— Is $\frac{2}{5}$ equivalent to $\frac{4}{10}$ or 0.4?

— What is another name for $\frac{6}{10}$?

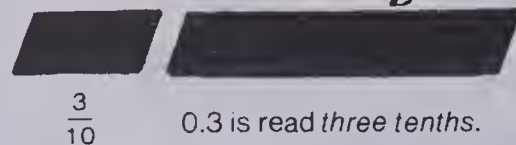
Renaming Tenths

Patsy marked a board in 10 equal parts.
She cut off 3 parts.
What part did she cut off?



Another name for $\frac{3}{10}$ is 0.3.

0.3 is the **decimal** for $\frac{3}{10}$.



Exercises

Write the fraction and decimal for each.

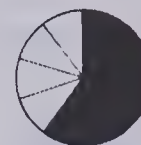
1. How many tenths are coloured?

$\frac{3}{10}$ is coloured.

0.3 is coloured.

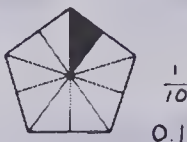


2. How many tenths are coloured? $\frac{6}{10}$, 0.6



Write the fraction and decimal for each coloured part.

3.



$\frac{1}{10}$
0.1

4.



$\frac{5}{10}$
0.5

5.



$\frac{9}{10}$
0.9

6. Match the fractions and decimals.



$\frac{5}{10}$ (iii)

(b) $\frac{3}{10}$ (i)

(c) $\frac{9}{10}$ (iv)

(d) $\frac{1}{10}$ (v)

(e) $\frac{4}{10}$ (ii)

(i) 0.3

(ii) 0.4

(iii) 0.5

(iv) 0.9

(v) 0.1

Using the Book Discuss the display. Note that the zero is always written before the decimal point if there are no ones in the number.

Do Exercises 1 and 2 orally. Emphasize that both $\frac{3}{10}$ and 0.3 name the same number.

7. Complete the chart for the coloured part.

Fraction	Decimal	
$\frac{7}{10}$	0.7	
$\frac{2}{10}$	0.2	
$\frac{4}{10}$	0.4	

8. Match the picture and the decimal for the part that is coloured.

(vi)

(i) 0.5 (ii) 0.9 (iii) 0.2
(iv) 0.6 (v) 0.1 (vi) 0.4

(c)

(e)

(b)

(d)

(f)

(ii) (i) (iv) (v) (vi)

Write the decimal for each.

9. five tenths 0.5 10. seven tenths 0.7 11. nine tenths 0.9

Write the decimal.

12. 0.6 13. 0.2

14. 0.1 15. 0.9

Introducing decimal notation 133

Names for One — How many fifths equal one?

Adding Decimals — Three tenths and two tenths — altogether?

Subtracting Decimals — One and 2 tenths — subtract 9 tenths.

— How much is left? What is the difference?

Students can make up their own matching games for these bars by making cards with fraction names, decimal names, or equations on them. They then match their bars to the cards.

Example

$\frac{3}{5}$ three fifths

$\frac{6}{10}$

0.6

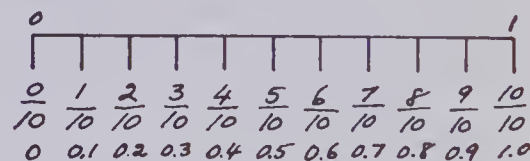
2. Select the tenths from the picture cards set (see Activity 3, page 130). Make a matching set of decimal cards.

0.1 0.2

Also select the tenths from the fraction cards (see Activity 3, page 129).

The students can be challenged to match the cards in the three sets.

3. Have students make a number line showing fraction and decimal equivalents. These can be displayed on the bulletin board.



EXTRA PRACTICE

1. Give the missing numerators and denominators.

$$\begin{array}{l} \frac{1}{2} = \frac{\square}{4} \quad \frac{2}{5} = \frac{4}{\square} \quad \frac{1}{4} = \frac{\square}{8} \quad \frac{2}{6} = \frac{\square}{3} \\ \frac{2}{4} = \frac{4}{\square} \quad \frac{2}{3} = \frac{\square}{6} \quad \frac{4}{5} = \frac{\square}{10} \quad \frac{3}{4} = \frac{6}{\square} \\ \frac{8}{10} = \frac{4}{\square} \quad \frac{5}{10} = \frac{1}{\square} \quad \frac{6}{8} = \frac{\square}{4} \quad \frac{6}{10} = \frac{\square}{5} \\ \frac{4}{6} = \frac{\square}{3} \quad \frac{2}{10} = \frac{1}{\square} \end{array}$$

2. *Extension.* Copy and complete.

$$\begin{array}{l} \frac{1}{5} = \frac{\square}{10} = 0.\square \quad \frac{2}{5} = \frac{\square}{10} = 0.\square \\ \frac{3}{5} = \frac{\square}{10} = 0.\square \quad \frac{4}{5} = \frac{\square}{10} = 0.\square \\ \frac{1}{2} = \frac{\square}{10} = 0.\square \quad \frac{0}{5} = \frac{\square}{10} = 0.\square \\ \frac{0}{4} = \frac{\square}{10} = 0.\square \end{array}$$

3. HMS—DM38.

OBJECTIVE

To write one whole as a fraction

PACING

Level A All
Level B All
Level C 5-8

MATERIALS

shapes to cut out, fraction wheels or fraction bars (DM37), flannel board and fraction set

RELATED AIDS

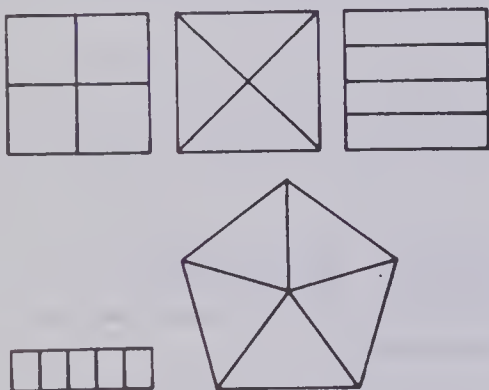
HMS — DM37.

SUGGESTIONS

Initial Activity Distribute a worksheet with diagrams of shapes marked into halves, thirds, quarters, etc. Have the students cut out one shape. Then cut the shape into the indicated number of parts. Have students put the parts back together to make one whole. Repeat the process for other shapes. Emphasize that $\frac{2}{2}$, $\frac{3}{3}$, etc. are one whole and we can write 1 in fraction form.

ACTIVITIES

1. Make sets of cards with one whole cut into equal pieces. Scramble the pieces. Have students put the pieces together to make one whole and then have them write statements to describe their constructions (e.g., $\frac{4}{4} = 1$, $\frac{5}{5} = 1$, etc.).

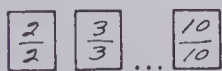


2. Add these cards to the picture cards set (see Activity 3, page 130)



and

these cards to the fraction set (see Activity 3, page 129).



Also add

this card to the decimal set (see Activity 2, page 133) 1.0 .



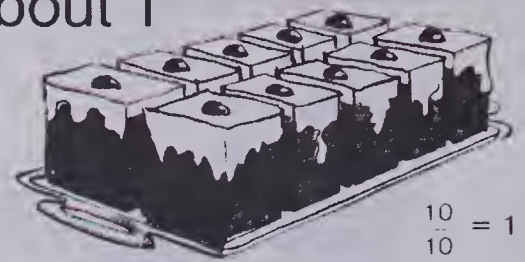
More About 1

Marcy cut a cake into tenths.

How many pieces were there? 10

How many tenths make a whole cake? 10

Complete: $\frac{10}{10} = 1$

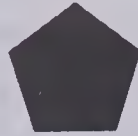


$$\frac{10}{10} = 1$$

Exercises

Write a number sentence for each picture.

1.



$$\frac{5}{5} = 1$$

2.



$$\frac{10}{10} = 1$$

3.



$$\frac{10}{10} = 1$$

4.



$$\frac{3}{3} = 1$$

5.



$$\frac{9}{9} = 1$$

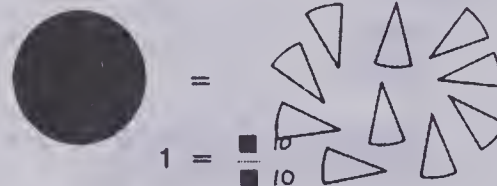
6.



$$\frac{10}{10} = 1$$

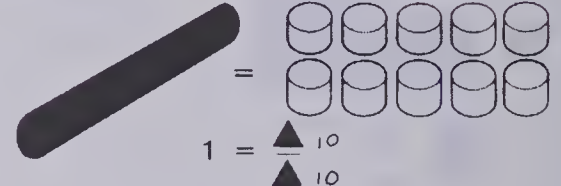
Write a number sentence for each.

7. Mark and Sue cut their pizza into 10 parts. They ate all 10 parts.



$$1 = \frac{10}{10}$$

8. Jill and Bill cut 1 log into firewood. They cut it into 10 pieces.



$$1 = \frac{10}{10}$$

134 Writing fractions equivalent to 1

Using the Book Have the students cut one whole into tenths and then put it together again into one whole.

Assign the exercises.

Students are to match equivalent fractions and decimals. For group A, select only the halves, fifths, and tenths from each set. For group B, separate the sets into a set containing halves, fifths, and tenths and the other set containing thirds, fourths, sixths, and eighths. For group C, the three sets can be put together into one set.

Variation:

Play "Snap" using equivalent fractions.

3. Provide the students each with a set of fraction bars, as described in Activity 1, pages 132-133 (or see DM37). Ask them to make "1" in as many ways as possible. This can be done in a number of ways, i.e.,

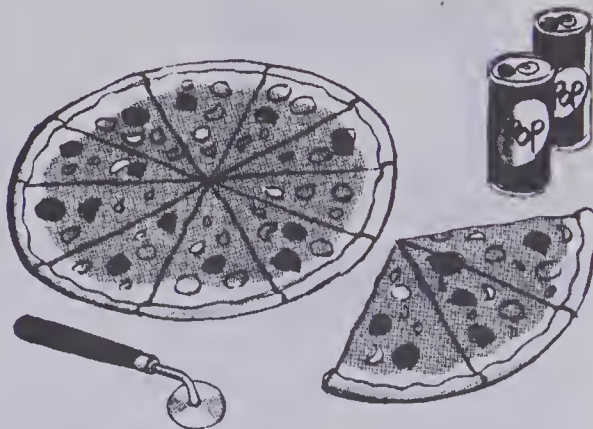
$$\frac{2}{2} + \frac{5}{5} + \frac{10}{10} + \frac{2}{10} + \frac{5}{10} + \frac{3}{10} = \frac{10}{10} + \frac{4}{10} + \frac{6}{10} = \frac{10}{10}$$

Decimal Numbers Greater Than 1

Darcy had a pizza party.
There were thirteen
pieces left over.
Each piece was one tenth of a pizza.
How many wholes and how
many tenths were left over?

$$\frac{13}{10} = \frac{10}{10} + \frac{3}{10}$$

= 1 one and 3 tenths 1.3



Exercises

Complete the chart.

	Tenths	Ones and Tenths	Decimals
1.	$\frac{13}{10}$	$1\frac{3}{10}$	1.3
2.	$\frac{35}{10}$	$3\frac{5}{10}$	3.5
3.	$\frac{24}{10}$	$2\frac{4}{10}$	2.4

Write each fraction as a decimal.

1.9
 2.7
 6. 3.8
 7. 5.6
 8. 7.9

How many ones and how many tenths? 2.7 — 2 ones and 7 tenths

3.6
 2.1
 11. 4.5
 12. 0.1
 13. 2.0
 14. 0.8
 15. 3.0

Writing decimals greater than 1 135

Using the Book Discuss the display. Emphasize that it is necessary to make one (or more) whole and then find the leftovers. Illustrate using the 1 fraction bar and show how $\frac{13}{10}$ is $1\frac{3}{10}$.

ANSWERS

9. 3.6 — 3 ones and 6 tenths 10. 2.1 — 2 ones and 1 tenth 11. 4.5 — 4 ones and 5 tenths
 12. 0.1 — 0 ones and 1 tenth 13. 2.0 — 2 ones and 0 tenths 14. 0.8 — 0 ones and 8 tenths
 15. 3.0 — 3 ones and 0 tenths

ACTIVITIES

1. Give each student a set of fraction bars (DM37) (or fraction wheels in tenths). As you call out each number the student shows the number using the fraction bar or fraction wheels.

Example

You call $\frac{16}{10}$.

(The student shows $\frac{6}{10}$ and $\frac{10}{10}$ for $1\frac{6}{10}$.)

2. Repeat Activity 1, but you call the mixed numeral, i.e., " $1\frac{3}{10}$ ". The student shows $\frac{13}{10}$ and writes the improper fraction.

3. Prepare a "Fractions-Decimals Game".

$\frac{1}{10}$	$\frac{2}{10}$...	$\frac{10}{10}$	$\frac{11}{10}$...	$\frac{19}{10}$	$\frac{20}{10}$
0.1	0.2	...	1.0	$1\frac{1}{10}$...	$1\frac{9}{10}$	2
				1.1		1.9	2.0

Make a set of matching cards as illustrated. Play the game like "Snap" to match pairs.

EXTRA PRACTICE

- Use HMS — DM39.
- How many ones and how many tenths? Write a decimal.

OBJECTIVE

To write decimal numbers greater than one

PACING

Level A All
 Level B All
 Level C All

MATERIALS

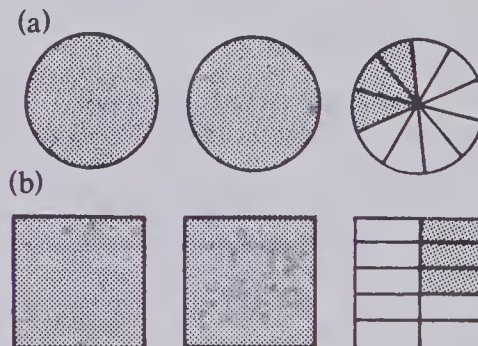
fraction wheel (page 130), fraction bars (DM37)

RELATED AIDS

HMS — DM37 and DM39.

SUGGESTIONS

Initial Activity Use the fraction wheels and fraction bars to provide concrete experiences of ones and tenths. Use 13 tenths. Take a new pie plate and fill it with tenths ($\frac{10}{10}$). Emphasize this is a 1 (one whole pie). The pieces left over are the tenths. Show how we can write the fraction form ($\frac{13}{10}$), the form with a whole number and a fraction ($1\frac{3}{10}$), and the decimal form (1.3).



- How many ones and how many tenths? Draw a diagram to show each.
 - 2.5
 - 1.6
- Each part is one tenth. Write each as a decimal.

(a)



(b)



Challenge your students with these two.

- Marcy and Darcy had pieces of pizza left over after their party. Each piece was one tenth. They had twelve pieces. Write what they had left as a decimal.
- Stella and Della had 1.4 pizza. How many tenths did they have?

OBJECTIVES

- To measure using the decimetre
- To draw a segment a given length (in decimetres)
- To express centimetres as decimal parts of a decimetre

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

segment, decimetre

MATERIALS

rulers marked in centimetres and decimetres

SUGGESTIONS

Initial Activity Review the use of a centimetre ruler for measuring lengths of objects. Find the centimetre scale and measure 2 or 3 objects using centimetres. Then find one decimetre on the ruler. Determine the number of centimetres in 1 dm, 1.5 dm, 2 dm, etc.

Review the procedure for writing one tenth ($\frac{1}{10}$) as 0.1 (page 132).

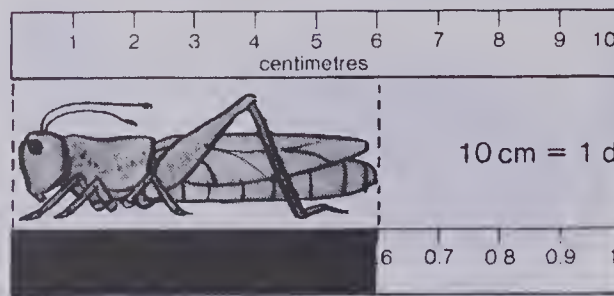
ACTIVITIES

1. Have students measure in centimetres and decimetres several objects in the classroom.

2. Prepare a "seek and find" activity for students. Before the lesson, measure some objects in the room in centimetres and decimetres. Challenge the students to find objects 2 dm, 0.6 dm, etc. in length.

3. Have students practise estimation by writing on the chalkboard the names of 5 small objects they can see in the classroom. Have them estimate the length of each object in centimetres and decimetres. Have students measure the objects to find the actual lengths.

The Decimetre



$$10 \text{ cm} = 1 \text{ dm}$$

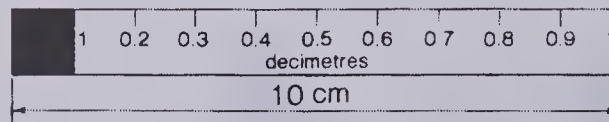
$$1 \text{ cm} = 0.1 \text{ dm}$$

- Number of parts shaded = 6
- Number of parts altogether = 10
- Six tenths of a decimetre = six centimetres.
- $0.6 \text{ dm} = 6 \text{ cm}$

A decimetre is 10 cm.
A centimetre is one tenth of a decimetre.

The length of the grasshopper is 0.6 dm or 6 cm.

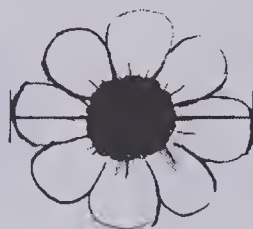
Exercises



- How many centimetres in a decimetre? 10 cm
- How many parts are shaded? 1
- How many parts altogether? 10
- The shaded part is 0.1 of a decimetre.

Measure in centimetres. Then measure in decimetres.

2.



4 cm
or
0.4 dm

3.

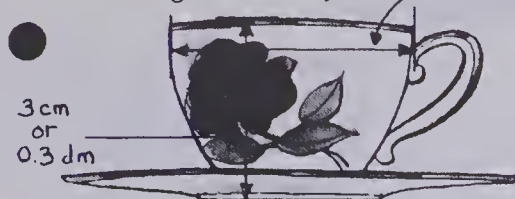


7 cm
or
0.7 dm

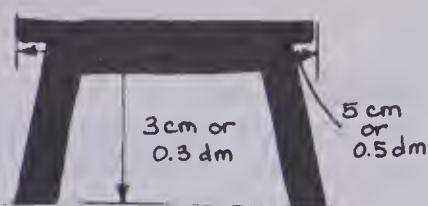
Using the Book Discuss the display. Use small objects (eraser, finger width, etc.) less than 1 dm in length and put them on the display between the rulers. Find the length of the objects in centimetres and decimetres.

Emphasize the relationship between centimetres and decimetres.
Do Exercises 1-3 with the class. Assign the exercises.

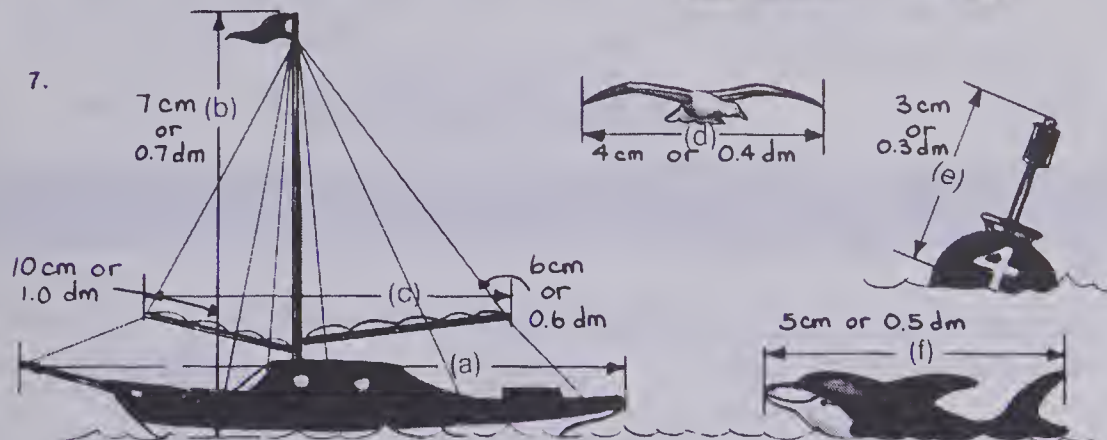
Write the lengths two ways.



6.



7.



Use your rulers.

8. Draw a segment 6 cm long.
9. Draw a segment 0.7 dm long.
10. Draw a segment 0.5 dm long.
Draw a segment 8 cm long.
Which is the longer segment? *8 cm segment.*
11. Draw a segment 0.7 dm long.
Draw a segment 7 cm long.
Which is the longer segment? *They are both the same.*
12. Copy and complete.

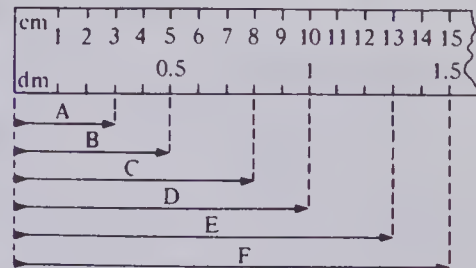
1 cm = 0.1 dm 4 cm = ■ dm 0.4 7 cm = ■ dm 0.7 10 cm = ■ dm 1.0
2 cm = ■ dm 0.2 5 cm = ■ dm 0.5 8 cm = ■ dm 0.8 ★ 11 cm = ■ dm 1.1
3 cm = ■ dm 0.3 6 cm = ■ dm 0.6 9 cm = ■ dm 0.9 ★ 12 cm = ■ dm 1.2

EXTRA PRACTICE

Copy and complete.

1 dm = ___ cm 3.5 dm = ___ cm
2 dm = ___ cm 3 dm = ___ cm
4 dm = ___ cm 6 dm = ___ cm
4.5 dm = ___ cm 6.3 dm = ___ cm

The ruler is marked in centimetres and decimetres. Give the length of each arrow in centimetres and in decimetres.



OBJECTIVES

- To measure using the metre marked in tenths
- To express decimetres as tenths of metres

PACING

- Level A All
- Level B All
- Level C All

MATERIALS

paper, metresticks (in tenths)

SUGGESTIONS

Initial Activity Review the procedure for renaming tenths ($\frac{1}{10}$) as decimal numbers (0.1) (page 132).
Provide students with the opportunity to make a metre length. Have students cut out 10 strips, each 1 dm long, and glue or tape the pieces together to make a metre length. (Also see HMS Book 3, page 113.)

ACTIVITIES

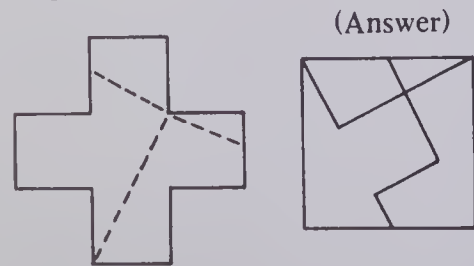
1. Children may enjoy playing "Concentration" as described in the Activity Reservoir. Adapt the cards to unit comparisons.
Example

3 dm 0.3 dm

2. Have the students copy and complete.

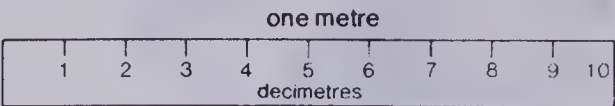
- | | |
|----------------|----------------|
| 1 dm = ___ m | 3 dm = ___ m |
| 4 dm = ___ m | 6 dm = ___ m |
| 7 dm = ___ m | 8 dm = ___ m |
| 9 dm = ___ m | 2 dm = ___ m |
| 5 dm = ___ m | 10 dm = ___ m |
| 0.1 m = ___ dm | 0.3 m = ___ dm |
| 0.9 m = ___ dm | 0.5 m = ___ dm |
| 0.6 m = ___ dm | 0.7 m = ___ dm |
| 0.4 m = ___ dm | 0.2 m = ___ dm |
| 1 m = ___ dm | 0.8 m = ___ dm |

3. Challenge:
Draw this shape composed of 5 squares. Cut the dotted lines. Then rearrange the four pieces to form a square.



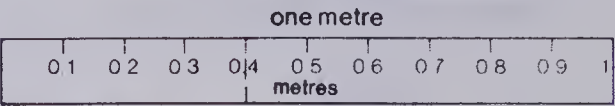
The Metre

Make a metrestick.
Mark it in decimetres.
Each part is 0.1 of the metre.



1 dm = 0.1 m

Label your metrestick in tenths.



The arm is 0.4 m long.

1 dm is one tenth of a metre.
1 dm = 0.1 m

Exercises

Use your metrestick marked in tenths of a metre.
Copy and complete the chart.

1. width of this book	■ dm	0. ■ m
2. length of pen	■ dm	■ m
3. length of shoe	■ dm	■ m
4. width of desk	■ dm	■ m
5. width of door	■ dm	■ m
6. width of exercise book	■ dm	■ m
7. length of new chalk	■ dm	■ m
8. Choose 4 other items.	■ dm	■ m

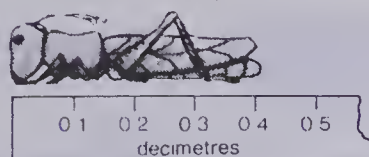
Copy and complete.

- | | |
|--|---|
| 9. 3 dm = ³ tenths of a metre | 10. 8 dm = ⁸ tenths of a metre |
| 11. 5 dm = ⁰⁵ m | 12. 1 dm = ⁰¹ m |
| 13. 0.3 m = ³ dm | 14. 0.5 m = ⁵ dm |

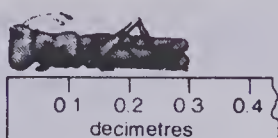
Using the Book Emphasize the relationship between decimetres and metres:
1 dm = 0.1 m
10 dm = 1 m
Ensure that each student has practice in measuring as indicated by Exercises 1-8.

Adding Decimals

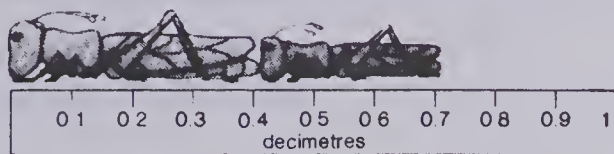
Angus measured two grasshoppers.



0.4 dm



0.3 dm



The two grasshoppers together measure 0.7 dm.

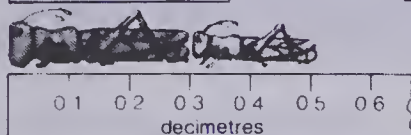
$$\begin{array}{r} 0.4 \\ + 0.3 \\ \hline 0.7 \end{array}$$

Exercises

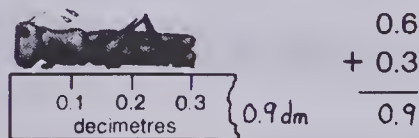
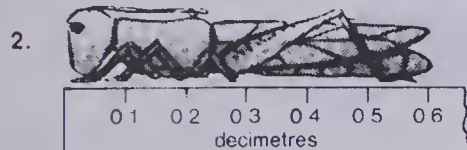
Calculate the total length of each pair of grasshoppers.



$$\begin{array}{r} 0.3 \\ + 0.2 \\ \hline 0.5 \end{array}$$



The grasshoppers together measure 0.5 dm.



$\begin{array}{r} 0.4 \\ + 0.2 \\ \hline 0.6 \end{array}$	$\begin{array}{r} 0.3 \\ + 0.3 \\ \hline 0.6 \end{array}$	$\begin{array}{r} 0.3 \\ + 0.5 \\ \hline 0.8 \end{array}$	$\begin{array}{r} 0.4 \\ + 0.5 \\ \hline 0.9 \end{array}$	$\begin{array}{r} 0.6 \\ + 0.2 \\ \hline 0.8 \end{array}$	$\begin{array}{r} 0.1 \\ + 0.8 \\ \hline 0.9 \end{array}$
---	---	---	---	---	---

Addition of 1-digit decimals 139

OBJECTIVE

To add tenths written in decimal form (no regrouping)

PACING

Level A All
Level B All
Level C All

MATERIALS

grasshoppers (see display), rulers in decimetres (tenths) (or centimetres)

SUGGESTIONS

Initial Activity Have students make grasshoppers of various lengths (grasshoppers are really 3 ovals with legs). Put various combinations of grasshoppers above a ruler and read the total length as the sum of two decimals.

Example

$$0.5 + 0.4 = 0.9$$

You may wish to substitute straws or rods of different lengths for grasshoppers. Have students find the combined length of 2 straws or rods by placing them along a ruler.

Using the Book Discuss the display. Emphasize that in the addition of decimals, the decimal points must be lined up before beginning the addition.

ACTIVITIES

1. Use the metresticks marked in tenths (see page 138). Measure appropriate objects on the metrestick to replicate activities illustrated on page 139. Items might be:

- two pencils
- two crayons
- two shoes
- two books
- two rulers (30 cm type)
- two pop straws.

2. Prepare two decimal fact wheels such as:



Children take turns spinning an arrow on each wheel and recording the sum.

Example

$$\begin{array}{r} 0.1 \\ + 0.6 \\ \hline 0.7 \end{array}$$

Overall winner is the first person to record the greatest sum of the group five separate times.

EXTRA PRACTICE

Add.

1. $\begin{array}{r} 0.2 \\ + 0.5 \\ \hline \end{array}$	2. $\begin{array}{r} 0.1 \\ + 0.6 \\ \hline \end{array}$	3. $\begin{array}{r} 0.4 \\ + 0.1 \\ \hline \end{array}$
--	--	--

4. $\begin{array}{r} 0.7 \\ + 0.2 \\ \hline \end{array}$	5. $\begin{array}{r} 0.3 \\ + 0.2 \\ \hline \end{array}$
--	--

6. $0.4 + 0.3 = \underline{\quad}$	7. $0.5 + 0.1 = \underline{\quad}$
8. $0.4 + 0.4 = \underline{\quad}$	

9. $\begin{array}{r} 0.1 \\ 0.6 \\ + 0.2 \\ \hline \end{array}$	10. $\begin{array}{r} 0.3 \\ 0.2 \\ + 0.1 \\ \hline \end{array}$	11. $\begin{array}{r} 0.5 \\ 0.1 \\ + 0.3 \\ \hline \end{array}$
---	--	--

12. $\begin{array}{r} 0.4 \\ 0.2 \\ + 0.2 \\ \hline \end{array}$

OBJECTIVES

To read a decimetre ruler for lengths greater than one decimetre
To write decimal numbers greater than one

PACING

- Level A All
- Level B All
- Level C All

BACKGROUND

On this page, we will be working with lengths greater than one unit.

SUGGESTIONS

Initial Activity Review the decimetre length using a ruler and note the decimal parts (centimetres) of the decimetre.

Use rods or straws of different lengths (page 139). Place 2 rods or straws along a ruler to find the total length in decimetres.

ACTIVITIES

1. Prepare a “seek and find” activity for students. Measure objects in the room before the lesson. Then challenge the students to find objects.

(a)

Length	Object	Written as a decimal
2 dm + 0.4 dm		
3 dm + 0.9 dm		

(b)

Length	Object	Written as __ dm + 0. __ dm
1.3 dm		

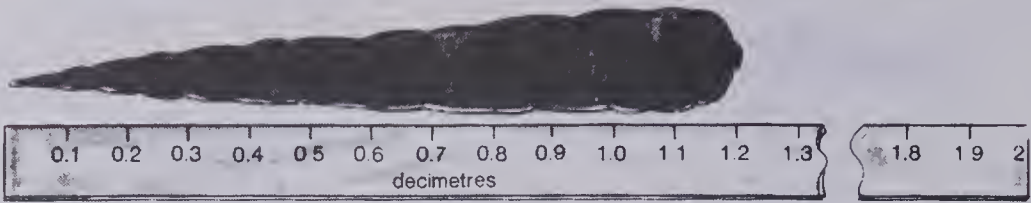
2. Repeat Activity 1, but give all measures in metres and tenths of metres.

3. See the Fact-Folder idea in the Activity Reservoir.

Use computations such as:

1. 3 dm and 0.5 dm
2. 9 dm and 0.1 dm
3. 4 dm and 0.2 dm
4. 7 dm and 0.6 dm
5. 6 dm and 0.8 dm
6. 8 dm and 0.4 dm
7. 5 dm and 0.5 dm
8. 3 dm and 0.7 dm
9. 9 dm and 0.6 dm
- ★10. 3 dm and 3 cm
- ★11. 6 dm and 7 cm
- ★12. 1 dm and 2 cm

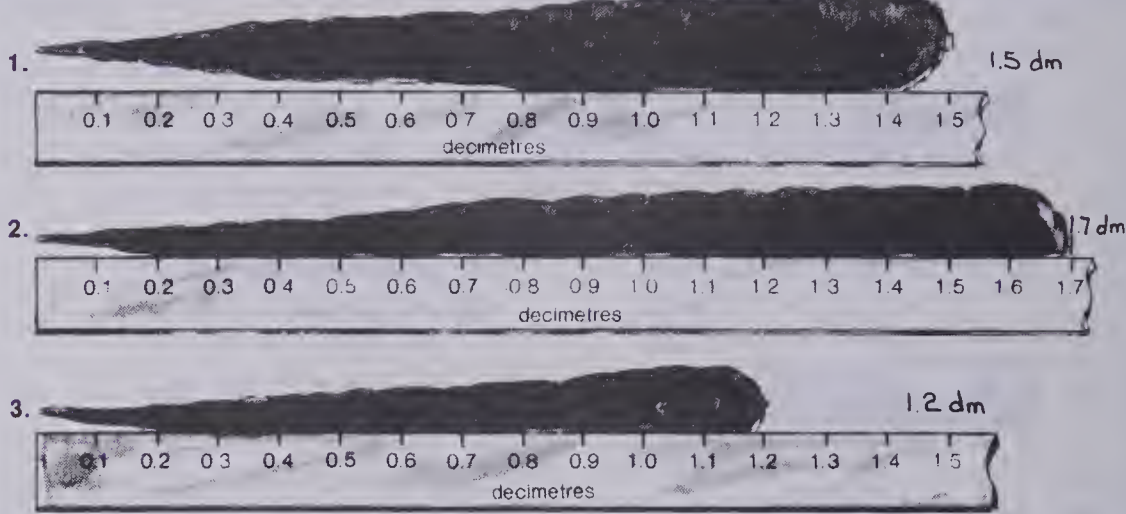
Reading a Decimal Ruler



The length of the carrot is 1.2 dm.
 $1\text{ dm} + 0.2\text{ dm} = 1.2\text{ dm}$

Exercises

What is the length in decimetres?



Write each as a decimal.

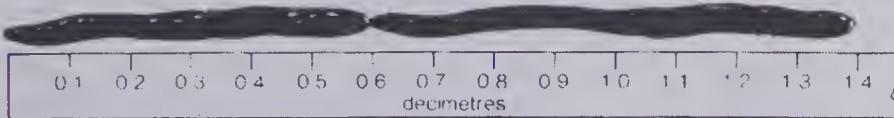
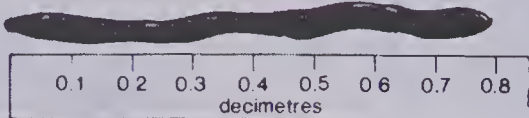
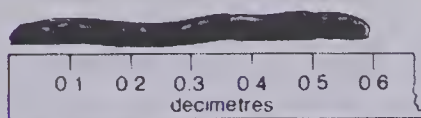
4. 1 dm and 0.3 dm → 1.3 dm
5. 2 dm and 0.9 dm → 2.9 dm
6. 4 dm and 0.5 dm → 4.5 dm

140 Decimals greater than 1 the decimetre

Using the Book Discuss the display. Note the 1 dm length on the display ruler and how the overall measurement of length was arrived at.

Adding Decimals

Bruno measured earthworms.

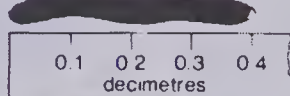
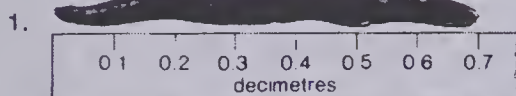


$$\begin{array}{r} 0.6 \\ + 0.8 \\ \hline 1.4 \end{array}$$

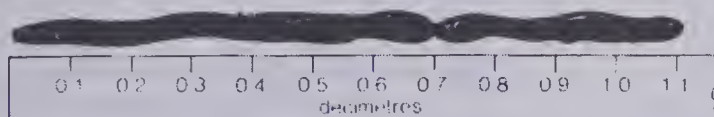
Together the earthworms are 1.4 dm long.

Exercises

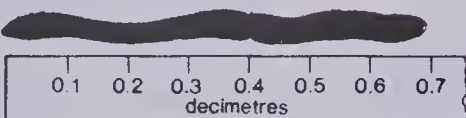
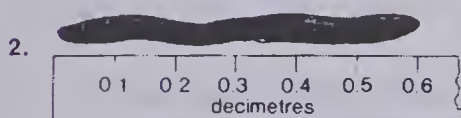
Calculate the lengths of the two.



1.1 dm



$$\begin{array}{r} 0.7 \\ + 0.4 \\ \hline 1.1 \end{array}$$



1.3 dm

$$\begin{array}{r} 0.6 \\ + 0.7 \\ \hline 1.3 \end{array}$$

Add.

0.6	0.4	5. 0.8	6. 0.9	7. 0.7	8. 0.9
+ 0.9	+ 0.9	+ 0.7	+ 0.3	+ 0.9	+ 0.1
<hr/> 1.5	<hr/> 1.3	<hr/> 1.5	<hr/> 1.2	<hr/> 1.6	<hr/> 1.0

Addition of decimals, 2-digit sums 141

OBJECTIVE

To add tenths written in decimal form (with regrouping)

PACING

Level A All
Level B All
Level C All

MATERIALS

rods, straws of different lengths, objects from Activity 1, page 139

RELATED AIDS

HMS — DM40.

SUGGESTIONS

Initial Activity Review addition of whole numbers with regrouping. Use two concrete objects (cutouts of worms and grasshoppers or rods, straws, etc.) whose combined length is more than 1 dm. Have students write the problem which they have set up with concrete objects in the form:

$$\begin{array}{r} 0.3 \\ + 0.8 \\ \hline 1.1 \end{array}$$

Using the Book Discuss the display. Emphasize that adding decimals is the same as adding whole numbers (after the decimal points have been aligned). Then say to the students who have been asked to work at the chalkboard: "I have a worm 0.5 cm and another 0.8 cm long. How long are they together?" Students are to write:

$$\begin{array}{r} 0.5 \\ + 0.8 \\ \hline 1.3 \end{array}$$

ACTIVITIES

1. Use Activity 2 from page 139, modified to permit addition of decimals involving regrouping.

2. Students may enjoy playing "What's Happening?" as described in the Activity Reservoir. The game begins with the students naming a decimal number.

Student	Teacher Reply
0.4	0.9
0.9	1.4
0.1	0.6

Students should recognize that 0.5 is added to the students' numbers.

3. Provide the students with a number of square additions. Explain how they check their work as the two outer sums should have the same answers.

Add.

0.3	0.5	
0.4	0.6	

0.2	0.9	
0.8	0.3	

0.6	0.3	
0.5	0.6	

0.6	0.6	
0.5	0.7	

0.2	0.9	
0.8	0.1	

0.7	0.6	
0.2	0.8	

EXTRA PRACTICE

HMS — DM40 (measuring and adding decimals).

OBJECTIVE

To practise adding tenths written in decimal form

PACING

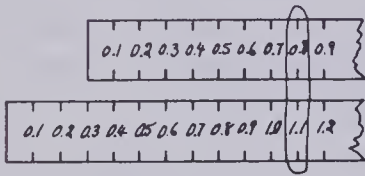
- Level A 1-15, 21-24
- Level B All
- Level C 6-24

SUGGESTIONS

Initial Activity In discussion, elicit from students that adding decimals (after the decimal points have been lined up) is like adding whole numbers.

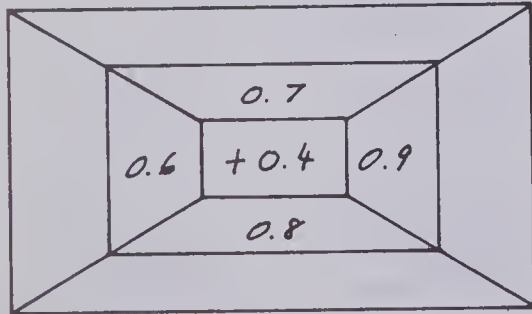
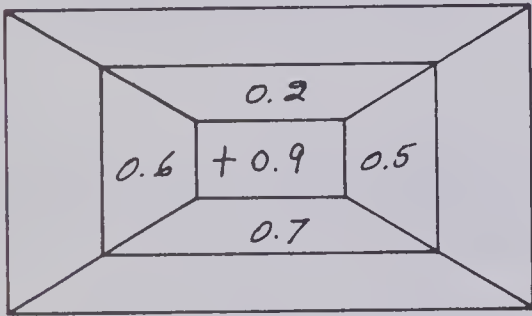
ACTIVITIES

1. Provide the students with 2 strips of cardboard marked as shown:



To add 0.3 + 0.8, we set the two strips as shown. The answer is read as 1.1. Students having difficulty with addition may find this aid useful.

2. Have students complete these operation squares. Then have them make some of their own.



Students put their answers in the outside space.

EXTRA PRACTICE

1. Reproduce this chart for the students to complete.

Practice

0.3
+ 0.9

1.2

0.30.9

0.10.20.30.40.50.60.70.80.91.01.11.21.31.41.5

decimetres

Exercises

Add.

1.0.1
+ 0.6

0.7

2.0.4
+ 0.3

0.7

3.0.6
+ 0.6

1.2

4.0.7
+ 0.6

1.3

5.0.8
+ 0.4

1.2

6.0.7
+ 0.8

1.5

7.0.9
+ 0.4

1.3

8.0.5
+ 0.7

1.2

9.0.8
+ 0.2

1.0

10.0.9
+ 0.1

1.0

11.0.5
+ 0.5

1.0

12.0.7
+ 0.7

1.4

13.0.8
+ 0.5

1.3

14.0.9
+ 0.9

1.8

15.0.7
+ 0.3

1.0

16.0.4
+ 0.5

0.9

17.0.9
+ 0.5

1.4

18.0.6
+ 0.5

1.1

19.0.3
+ 0.5

0.8

20.0.2
+ 0.9

1.1

Solve.

21. One earthworm is 0.6 cm long.
Another is 0.8 cm long.
How long are they together? 1.4 cm

22. Red crayon is 0.9 dm long.
Black crayon is 0.8 dm long.
How long are they together? 1.7 dm

23. One ribbon is 0.8 m long.
Another is 0.9 m long.
How much ribbon altogether? 1.7 m

24. One trout is 0.4 m long.
Another is 0.3 m long.
How long are they together? 0.7 m

142 Adding decimals: practice

Using the Book Assign the exercises. You may ask a group of students to do the first 10 on the chalkboard — one each. You will see quickly who is not having difficulty. Also, the answers will be available for others to check their work once they have it done. Some students may need help to do the addition using the ruler in the display.

+	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.1									
0.2									
0.3									
0.4									
0.5									
0.6									
0.7									
0.8									
0.9									

2. Challenge with these two problems.

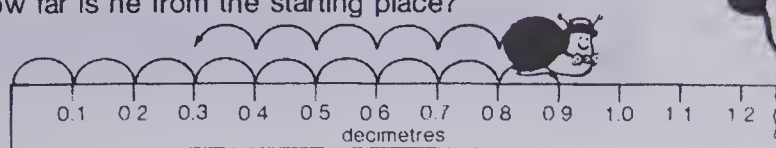
(a) A pine cone is 0.3 m long.
Another is 0.2 m long.
A third is 0.4 m long.
How long are they together?

(b) One nail is 0.5 dm long.
Another nail is 0.8 dm long.
A third nail is 0.3 dm long.
How long are the two longest together?

142

Subtracting Decimals

Sam, the snail, crawled along the ruler 0.9 dm.
He turned and crawled back 0.6 dm.
How far is he from the starting place?



He is 0.3 dm from his starting place.

$$\begin{array}{r} 0.9 \\ - 0.6 \\ \hline 0.3 \end{array}$$



Exercises

1. Sam crawled along the ruler 0.8 dm.
He crawled back 0.4 dm.

How far is he from the starting place? $0.8 \text{ dm} - 0.4$

0.8

- 0.4



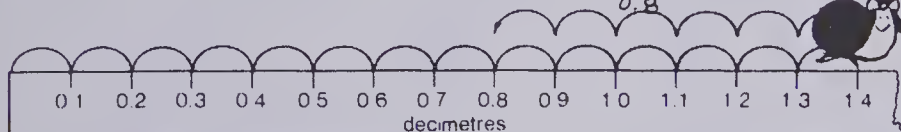
2. Cynthia crawled along a ruler 1.4 dm.

She crawled back 0.6 dm.

How far is she from the starting place? $1.4 \text{ dm} - 0.6$

1.4

- 0.6



0.9	1.6	5. 1.4	6. 1.3	7. 0.9	8. 1.6
- 0.6	- 1.2	- 0.5	- 0.3	- 0.8	- 0.9
0.3	0.4	0.9	1.0	0.1	0.7

Subtraction of decimals 143

Using the Book Discuss the display. Emphasize that subtraction of decimals is just like subtraction of whole numbers (after the decimal points have been aligned).

Assign the exercises. Some students will need the number line to do the subtraction.

OBJECTIVE

To subtract tenths written in decimal form

PACING

Level A All
Level B All
Level C All

MATERIALS

Sam the snail (see display), rulers

RELATED AIDS

HMS — DM19, DM40, and DM41.

SUGGESTIONS

Initial Activity You may wish to have students cut out a model of Sam, the snail. Do subtraction problems using Sam moving along a ruler. Have students write the problems they have done using Sam in the form:

$$\begin{array}{r} 0.5 \\ - 0.2 \\ \hline 0.3 \end{array}$$

ACTIVITIES

1. Provide the students with a duplicated sheet of rulers as illustrated on page 143. Beside each ruler is written a subtraction problem. The student should show the path of Sam or Cynthia in order to obtain an answer to the problem.

2. Students can practise mental subtraction of decimals by playing "Draw". Make a deck of cards with 2 cards each of the decimal numbers 0.1 to 0.9. Deal 5 cards to each player and put the rest of the cards face down on the desk. The students group their cards to give 0 upon subtraction. These cards are discarded. Any combination of cards may be used, e.g., $0.4 - 0.4$ or $0.9 - 0.3 - 0.6$. When a player can't play, a card is taken from the centre pile. The winner is the first player to discard all cards.

3. See DM19 (operation wheels). Distribute for completion, using computations as exemplified in Exercises 3-8.

4. Use DM40. Ask the student to find the *difference* in lengths between each pair of pencils. They will have to decide which number is the greatest, place it on top, and the smaller number under it, i.e., white and blue.

$$\begin{array}{r} \text{Blue} \rightarrow 0.8 \\ \text{White} \rightarrow -0.7 \\ \hline \end{array}$$

0.1 dm difference

EXTRA PRACTICE

Use HMS — DM41.

OBJECTIVE

To subtract tenths written in decimal form (with regrouping)

PACING

Level A 1-15, 21, 22
Level B All
Level C 6-22

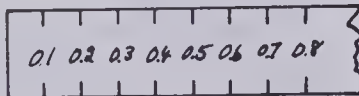
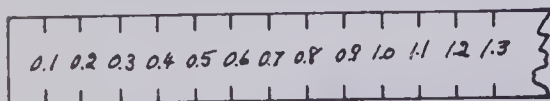
SUGGESTIONS

Initial Activity Review subtraction of whole numbers with regrouping. Use Sam the snail (page 143) to show subtraction of tenths from ones and tenths.

ACTIVITIES

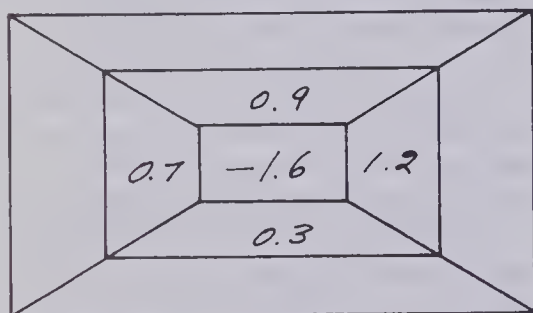
1. Use the cardboard ruler strips from Activity 1, page 142. Illustrate to the students how the strips can be used for subtraction.

$$\begin{array}{r} 1.2 \\ - 0.7 \\ \hline 0.5 \end{array}$$



Ask the students to use this aid to do any exercise on page 144 that they are not certain about.

2. Students can answer and make their own operation squares.



Students put their answers in the outside spaces.

EXTRA PRACTICE

1. Reproduce this chart for the students to complete.

	1.8	1.7	1.6	1.0	0.9	0.8	0.7	0.6
0.1								
0.2								
0.6								
0.7								
0.8								
0.9								

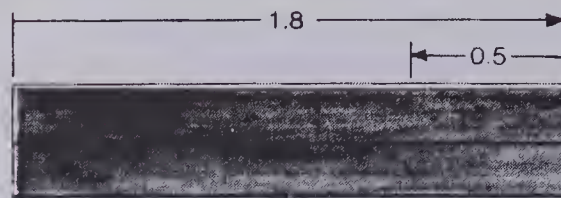
0.2	0.1

2. One earthworm is 1.9 dm long. A second is 0.9 dm long. How much longer is the first than the second?

3. A salmon is 0.9 m long. A trout is 0.3 m long. How much longer is the salmon?
- ★ 4. A pine cone is 1.9 dm. A fir cone is 0.8 dm. A spruce cone is 0.4 dm. How much longer is the longest than the shortest?
- ★ 5. One nail is 1.0 dm long. Another nail is 0.8 dm long. A third nail is 1.3 dm long. How much difference between the longest and shortest nails?

Practice

$$\begin{array}{r} 1.8 \\ - 0.5 \\ \hline 1.3 \end{array}$$



Exercises

Subtract.

- | | | | | |
|---|---|---|---|---|
| 1. $\begin{array}{r} 1.4 \\ - 0.6 \\ \hline 0.8 \end{array}$ | 2. $\begin{array}{r} 1.3 \\ - 0.5 \\ \hline 0.8 \end{array}$ | 3. $\begin{array}{r} 1.1 \\ - 0.8 \\ \hline 0.3 \end{array}$ | 4. $\begin{array}{r} 1.5 \\ - 0.9 \\ \hline 0.6 \end{array}$ | 5. $\begin{array}{r} 1.8 \\ - 0.9 \\ \hline 0.9 \end{array}$ |
| 6. $\begin{array}{r} 1.2 \\ - 0.8 \\ \hline 0.4 \end{array}$ | 7. $\begin{array}{r} 1.7 \\ - 0.9 \\ \hline 0.8 \end{array}$ | 8. $\begin{array}{r} 1.6 \\ - 0.8 \\ \hline 0.8 \end{array}$ | 9. $\begin{array}{r} 1.1 \\ - 0.1 \\ \hline 1.0 \end{array}$ | 10. $\begin{array}{r} 1.7 \\ - 0.7 \\ \hline 1.0 \end{array}$ |
| 11. $\begin{array}{r} 1.7 \\ - 0.5 \\ \hline 1.2 \end{array}$ | 12. $\begin{array}{r} 1.8 \\ - 0.2 \\ \hline 1.6 \end{array}$ | 13. $\begin{array}{r} 1.6 \\ - 0.3 \\ \hline 1.3 \end{array}$ | 14. $\begin{array}{r} 1.9 \\ - 0.6 \\ \hline 1.3 \end{array}$ | 15. $\begin{array}{r} 1.7 \\ - 0.8 \\ \hline 0.9 \end{array}$ |
| 16. $\begin{array}{r} 1.4 \\ - 0.3 \\ \hline 1.1 \end{array}$ | 17. $\begin{array}{r} 1.6 \\ - 0.7 \\ \hline 0.9 \end{array}$ | 18. $\begin{array}{r} 1.2 \\ - 0.6 \\ \hline 0.6 \end{array}$ | 19. $\begin{array}{r} 1.9 \\ - 0.3 \\ \hline 1.6 \end{array}$ | 20. $\begin{array}{r} 1.4 \\ - 0.7 \\ \hline 0.7 \end{array}$ |

Solve.

21. Red crayon is 1.6 dm long. Blue crayon is 0.9 dm long. How much longer is the red crayon? **0.7 dm**
22. Pink ribbon is 1.4 dm long. Yellow ribbon is 0.8 dm long. How much longer is the pink ribbon? **0.6 dm**

144 Subtraction of decimals, practice

Using the Book Discuss the display. If the number line is used for subtraction, regrouping will not occur. If students use the subtraction algorithm, an explanation that one whole is ten tenths (page 134) may require some review.

Emphasize that subtraction of decimals after having lined up the decimal points is the same as subtraction of whole numbers.

Place Value



one



one



one



6 tenths

3 ones and 6 tenths

ones (and) tenths
3 . 6

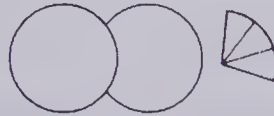
decimal number



1 one and 4 tenths
1.4



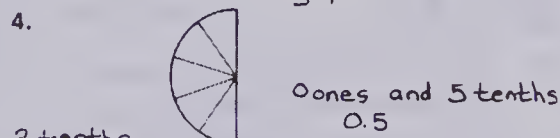
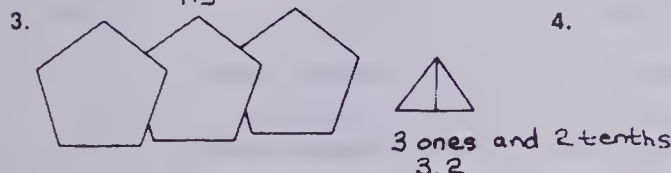
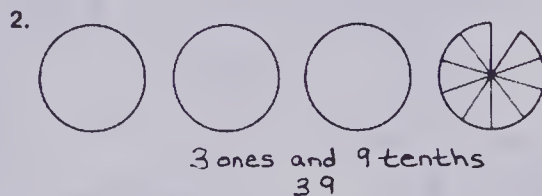
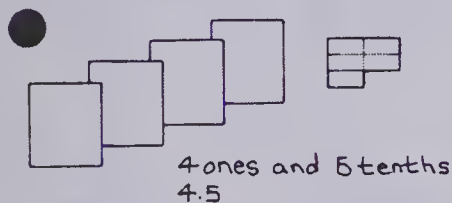
4 ones and 5 tenths
4.5



2 ones and 3 tenths
2.3

Exercises

How many ones and how many tenths? Write the decimal.



Place value: wholes and tenths 145

Using the Book Do the examples in the display with the students. Assign the exercises. (You may wish to do this whole page together in class and to complete pages 145 and 146 all in one day.)

OBJECTIVE

To write decimals involving ones and tenths for pictured quantities

PACING

Level A All
Level B All
Level C All

MATERIALS

fraction wheels divided into tenths,
units divided into tenths

RELATED AIDS

HMS — DM42.

SUGGESTIONS

Initial Activity Review the place-value chart for tens and ones. Discuss the fact that tenths have been used on previous pages. Ask, "Where would we put tenths in a place-value chart?" (With a decimal point to the right of ones.) You may have to point out to students that tens are more than ones and ones are more than tenths. Placing tenths to the right keeps the pattern.

tens	ones	.	tenths
------	------	---	--------

ACTIVITIES

1. Play "The P.V. Game", as described in the Activity Reservoir. Modify the activity to include tenths.

2. Ask students to complete challenges similar to the following: "Write a 4-digit number with a 6 in the one's place." "Write a 4-digit number with a 4 in the tenth's place." "Write the greatest 4-digit number with a 5 in the tenth's place." etc.

3. See "Traffic Lights" in the Activities section, pages 2-3. It can easily be modified to include tenths.

EXTRA PRACTICE

1. HMS — DM42.
2. Prepare a chalkboard exercise such as:

Write each as a decimal.

(a) $\frac{11}{10}$ (b) $\frac{15}{10}$ (c) $\frac{26}{10}$ (d) $\frac{22}{10}$ (e) $\frac{36}{10}$

How many ones and how many tenths?

(f) 2.3 (g) 0.8 (h) 1.6 (i) 3.7 (j) 7.9

OBJECTIVE

To use $>$, $=$, and $<$ to compare decimal numbers involving ones and tenths

PACING

Level A All
Level B All
Level C All

MATERIALS

fraction wheels

SUGGESTIONS

Initial Activity Review the meaning of each of the signs $>$, $=$, and $<$.

Review the method of comparison of 2-digit numbers: i.e., first examine the tens (largest place-value holder in number); if the ten's digits are the same, examine the ones.

ACTIVITIES

1. Using fraction wheels, set out a display similar to this:



Ask the students to write a decimal for each number represented. Then they are to use a symbol to show which is largest, i.e.,

$$1.6 < 2.1$$

Repeat for other displays.

Elicit from the students how they would do the question if the fraction wheels are not used.

2. Prepare a deck (about 40) of decimal cards numerically depicting 3.1, 4.9, etc. Add to the deck about 21 (1 of each) more cards showing $=$, $<$, or $>$ for a total deck of 61 cards. Children can play "Guessimal" using the same rules as for "Fraction Action" (page 131, Activity 2). Change scoring so that the winner of each hand scores the number shown in the tenth's place of his/her fourth (unused) card.

EXTRA PRACTICE

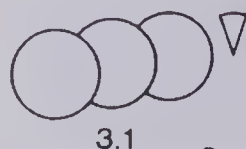
Provide these on duplicated sheets or copy on the chalkboard.

Use $>$, $=$, or $<$.

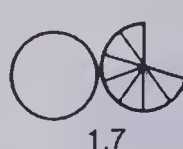
1. $2.1 \bullet 1.8$
2. $3.0 \bullet 0.3$
3. $1.2 \bullet 2.1$
4. $4.5 \bullet 5.4$
5. $1.8 \bullet 2.1$
6. $5.1 \bullet 3.9$
7. $6.0 \bullet 3.8$
8. $2.9 \bullet 2.4$
9. $3.8 \bullet 4.7$

Comparing Decimals

Which is more?



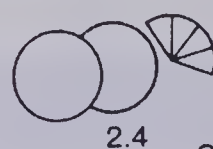
3.1



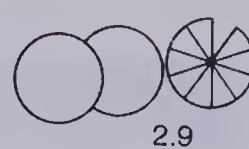
1.7

Compare the ones.

$$3.1 > 1.7$$



2.4



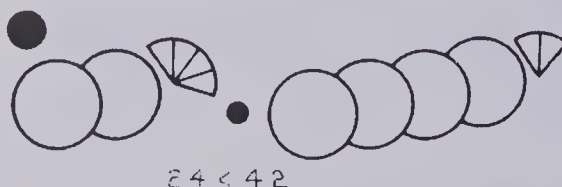
2.9

Compare the tenths.

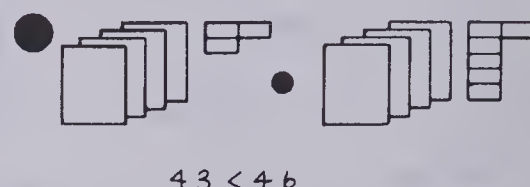
$$2.4 < 2.9$$

Exercises

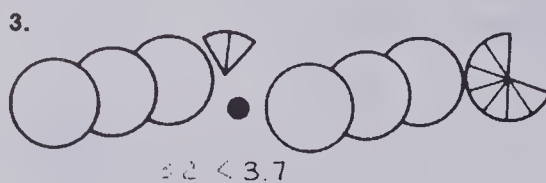
Write each numeral and use $>$, $<$, or $=$.



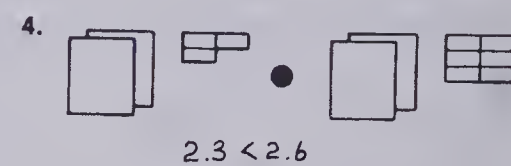
$$2.4 < 4.2$$



$$4.3 < 4.6$$



$$3.2 < 3.7$$



$$2.3 < 2.6$$

Use $>$, $=$, or $<$.

$$3.4 \bullet 2.1 >$$

$$6. 5.4 \bullet 7.6 <$$

$$7. 4.8 \bullet 4.8 =$$

$$8. 6.1 \bullet 6.3 <$$

9. John's ribbon is 6.5 dm long.

Jill's ribbon is 6.7 dm long.

Whose ribbon is longer? Jill's ribbon

10. Harry jumped 3.2 m.

Mark jumped 3.8 m.

Who jumped farther? Mark

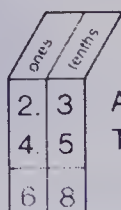
Using the Book Discuss and illustrate the display, using the fraction wheels. Note that, as with whole numbers, we find the larger number by first comparing the digits having the larger place value, then the next largest place value if the first-compared were equal.

Assign the exercises. Be certain that the children know how to write the answers in their workbooks.

Adding and Subtracting Decimals

Add.

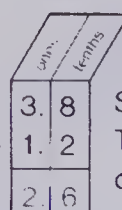
$$\begin{array}{r} 2.3 \\ + 4.5 \\ \hline 6.8 \end{array}$$



Add tenths.
Then add ones.

Subtract.

$$\begin{array}{r} 3.8 \\ - 1.2 \\ \hline 2.6 \end{array}$$



Subtract tenths.
Then subtract ones.

Exercises

Add.

1. $\begin{array}{r} 2.3 \\ + 1.4 \\ \hline 3.7 \end{array}$

2. $\begin{array}{r} 1.6 \\ + 3.2 \\ \hline 4.8 \end{array}$

3. $\begin{array}{r} 6.2 \\ + 2.3 \\ \hline 8.5 \end{array}$

4. $\begin{array}{r} 5.4 \\ + 2.4 \\ \hline 7.8 \end{array}$

5. $\begin{array}{r} 1.6 \\ + 0.2 \\ \hline 1.8 \end{array}$

6. $\begin{array}{r} 8.3 \\ + 1.6 \\ \hline 9.9 \end{array}$

7. $\begin{array}{r} 5.2 \\ + 2.4 \\ \hline 7.6 \end{array}$

8. $\begin{array}{r} 4.7 \\ + 3.2 \\ \hline 7.9 \end{array}$

9. $\begin{array}{r} 6.1 \\ + 1.8 \\ \hline 7.9 \end{array}$

10. $\begin{array}{r} 5.2 \\ + 2.6 \\ \hline 7.8 \end{array}$

Subtract.

11. $\begin{array}{r} 8.8 \\ - 2.3 \\ \hline 6.5 \end{array}$

12. $\begin{array}{r} 3.4 \\ - 1.2 \\ \hline 2.2 \end{array}$

13. $\begin{array}{r} 5.2 \\ - 3.1 \\ \hline 2.1 \end{array}$

14. $\begin{array}{r} 7.6 \\ - 2.1 \\ \hline 5.5 \end{array}$

15. $\begin{array}{r} 6.8 \\ - 2.7 \\ \hline 4.1 \end{array}$

16. $\begin{array}{r} 9.4 \\ - 7.2 \\ \hline 2.2 \end{array}$

17. $\begin{array}{r} 9.9 \\ - 5.4 \\ \hline 4.5 \end{array}$

18. $\begin{array}{r} 9.8 \\ - 8.7 \\ \hline 1.1 \end{array}$

19. $\begin{array}{r} 6.3 \\ - 4.1 \\ \hline 2.2 \end{array}$

20. $\begin{array}{r} 6.8 \\ - 4.8 \\ \hline 2.0 \end{array}$

21. Kirk ran 1.4 km.

Ace ran 2.6 km.

How much farther did Ace run? 1.2 km

22. Bess is 1.6 m tall.

Uri is 1.4 m tall.

How much taller is Bess? 0.2 m

Addition and subtraction of decimals 147

OBJECTIVE

To add and subtract ones and tenths written in decimal form (no regrouping)

PACING

Level A All

Level B All

Level C All

SUGGESTIONS

Initial Activity Review with the students the addition and subtraction of decimals as it was presented on pages 141-144, stressing the importance of lining up the decimal point.

For students who may need a concrete reference, a reminder of trips on a decimal number line may provide security and confidence. Not all students will need this and it may be desirable to take a group aside for this concrete stage of work with decimals.

ACTIVITIES

1. Have children complete these magic squares. They may enjoy making some of their own. (Answers are given in brackets.)

0.8	(0.1)	(0.6)
(0.3)	0.5	(0.7)
0.4	(0.9)	0.2

(6.6)	(7.1)	4.6
(4.1)	6.1	(8.1)
7.6	(5.1)	5.6

2. Provide the students with "dials" duplicated on cardboard. A "hand" of heavy cardboard is attached with a clip so the hand can rotate. Illustrate how this dial can be used to aid addition.



$$\begin{array}{r} 0.7 \\ + 2.1 \\ \hline 2.8 \end{array}$$

Using the Book Remind students that addition and subtraction of decimals is done the same way as addition and subtraction of whole numbers.

Some students may be able to do this page orally. Others may profit by using 0.5 cm graph paper on which to complete the exercises.

Provide addition problems for the students to do using the dial.

OBJECTIVE

To add ones and tenths written in decimal form (with regrouping)

PACING

Level A All
Level B All
Level C 6-22

MATERIALS

fraction wheel (page 130), dials (page 147, Activity 2) or ruler strips (page 142, Activity 1)

SUGGESTIONS

Initial Activity Review the concept of regrouping in addition. Set out 1.4 and 0.8, using fraction wheels. Regroup to show 2 ones and 2 tenths.

Use either dials or ruler strips to reinforce the concept of addition of decimals. Show how the numbers can be written in the place-value chart. Emphasize the one's and tenth's place values.

ACTIVITIES

1. Play "Bingo" as described in the Activity Reservoir.
2. Provide a pair of dice — one green and one brown. The numerals 4 to 9 are on the faces of each die. Identify one of the colours as ones, and the other as tenths.

The students, in turn, roll both dice twice. The numbers turned up on each roll are put into a place-value chart and added.

8.	6
4.	5
13.	1

The player with the greatest total after each round gains one point. First player to get 5 points is the overall winner. (Students may use calculators to check the answers.)

3. Encourage children to create and exchange addition grids with a classmate.

+	1.9	2.7	4.1	5.1
3.6				
0.8		3.5		
1.5				6.6
9.9				

More Addition



Add.

$$\begin{array}{r} 3.4 \\ + 5.8 \\ \hline 9.2 \end{array}$$

+

1	4
3.	4
5.	8
9.	2

12 tenths = 1 one and 2 tenths
1.2

Adding decimals is like adding whole numbers.

Exercises

How many ones and how many tenths?

1. 13 tenths 1 one and 3 tenths
2. 15 tenths 1 one and 5 tenths
3. 16 tenths 1 one and 6 tenths
4. 18 tenths 1 one and 8 tenths
5. 11 tenths 1 one and 1 tenth
6. 19 tenths 1 one and 9 tenths
7. 10 tenths 1 one and 0 tenths

Add.

$$\begin{array}{r} \bullet 1.6 \\ + 0.8 \\ \hline 2.4 \end{array}$$

$$\begin{array}{r} \bullet 2.8 \\ + 1.4 \\ \hline 4.2 \end{array}$$

$$\begin{array}{r} \bullet 5.6 \\ + 3.7 \\ \hline 9.3 \end{array}$$

$$\begin{array}{r} 11. 7.4 \\ + 2.9 \\ \hline 10.3 \end{array}$$

$$\begin{array}{r} 12. 3.4 \\ + 2.5 \\ \hline 5.9 \end{array}$$

$$\begin{array}{r} 13. 3.6 \\ + 1.9 \\ \hline 5.5 \end{array}$$

$$\begin{array}{r} 14. 1.4 \\ + 7.8 \\ \hline 9.2 \end{array}$$

$$\begin{array}{r} 15. 4.1 \\ + 3.6 \\ \hline 7.7 \end{array}$$

$$\begin{array}{r} 16. 6.7 \\ + 2.4 \\ \hline 9.1 \end{array}$$

$$\begin{array}{r} 17. 5.3 \\ + 1.8 \\ \hline 7.1 \end{array}$$

$$\begin{array}{r} 18. 3.7 \\ + 2.8 \\ \hline 6.5 \end{array}$$

$$\begin{array}{r} 19. 4.1 \\ + 2.9 \\ \hline 7.0 \end{array}$$

$$\begin{array}{r} 20. 9.5 \\ + 4.7 \\ \hline 14.2 \end{array}$$

$$\begin{array}{r} 21. 8.3 \\ + 3.9 \\ \hline 12.2 \end{array}$$

$$\begin{array}{r} 22. 7.6 \\ + 4.9 \\ \hline 12.5 \end{array}$$

148 Adding decimals with regrouping

Using the Book Most students will need no help with this page. For those who do, work with them alone or in small groups assembled in a corner or at a desk. Use the fraction wheel, dials, or ruler strips to reinforce the concept. Provide the students with time to experience the benefit of extra practice by engaging them in some of the activities listed for this page.

EXTRA PRACTICE

Provide the students with these additional exercises.

$$\begin{array}{r} 1. 1.8 \\ + 0.9 \\ \hline \end{array}$$

$$\begin{array}{r} 2. 3.4 \\ + 0.6 \\ \hline \end{array}$$

$$\begin{array}{r} 3. 7.1 \\ + 0.9 \\ \hline \end{array}$$

$$\begin{array}{r} 4. 4.8 \\ + 2.9 \\ \hline \end{array}$$

$$\begin{array}{r} 5. 4.9 \\ + 2.3 \\ \hline \end{array}$$

$$\begin{array}{r} 6. 9.8 \\ + 8.9 \\ \hline \end{array}$$

$$\begin{array}{r} 7. 8.6 \\ + 7.9 \\ \hline \end{array}$$

$$\begin{array}{r} 8. 9.6 \\ + 6.9 \\ \hline \end{array}$$

$$\begin{array}{r} 9. 8.8 \\ + 7.7 \\ \hline \end{array}$$

- ★10. Bill jogged 2.5 km on Saturday.
He jogged 3.6 km on Sunday.
He jogged 1.2 km on Monday.
How far did he jog altogether?

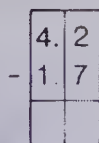
- ★11. Alice skated 2.8 km on Wednesday.
She skated 4.9 km on Thursday.
She skated 3.6 km on Friday.
How far did she skate altogether?

More Subtraction

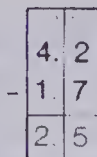


Subtract.

$$\begin{array}{r} 4.2 \\ - 1.7 \\ \hline 2.5 \end{array}$$



Can't subtract tenths.
Rename.



Now subtract tenths.
Then subtract ones.

Subtracting decimals is like subtracting whole numbers.

Exercises

Rename.

1. $4.2 = 3$ ones and 12 tenths

3. $5.8 = 5$ ones and 8 tenths

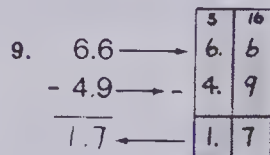
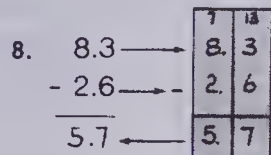
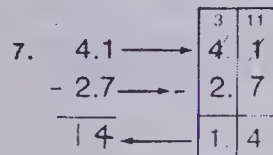
5. $3.4 = 3$ ones and 4 tenths

2. $3.6 = 3$ ones and 6 tenths

4. $6.3 = 6$ ones and 3 tenths

6. $7.1 = 7$ ones and 1 tenth

Subtract using the place-value chart.



Subtract.

10. $3.6 - 1.9$

$$\begin{array}{r} 3.6 \\ - 1.9 \\ \hline 1.7 \end{array}$$

11. $4.3 - 1.8$

$$\begin{array}{r} 4.3 \\ - 1.8 \\ \hline 2.5 \end{array}$$

12. $3.3 - 1.4$

$$\begin{array}{r} 3.3 \\ - 1.4 \\ \hline 1.9 \end{array}$$

13. $3.5 - 1.8$

$$\begin{array}{r} 3.5 \\ - 1.8 \\ \hline 1.7 \end{array}$$

14. $4.8 - 2.9$

$$\begin{array}{r} 4.8 \\ - 2.9 \\ \hline 1.9 \end{array}$$

15. $1.6 - 0.8$

$$\begin{array}{r} 1.6 \\ - 0.8 \\ \hline 0.8 \end{array}$$

16. $2.4 - 1.8$

$$\begin{array}{r} 2.4 \\ - 1.8 \\ \hline 0.6 \end{array}$$

17. $5.6 - 3.7$

$$\begin{array}{r} 5.6 \\ - 3.7 \\ \hline 1.9 \end{array}$$

18. $7.4 - 2.9$

$$\begin{array}{r} 7.4 \\ - 2.9 \\ \hline 4.5 \end{array}$$

19. $3.4 - 2.8$

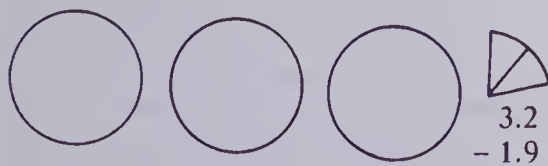
$$\begin{array}{r} 3.4 \\ - 2.8 \\ \hline 0.6 \end{array}$$

Subtracting decimals with regrouping 149

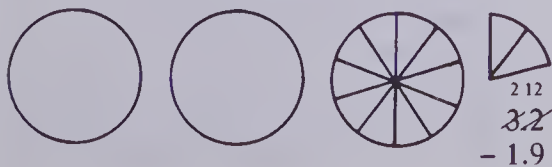
Using the Book Most students will need no help with this page. If some students need help, work with them alone or in small groups assembled in a corner or at a desk. Use the fraction wheels (or other aids) to reinforce the concept. They may benefit from engaging in some of the activities listed for this page.

ACTIVITIES

1. Place these fraction wheels on display for the problem.



Elicit from the students that in order to subtract 9 tenths we need to regroup one whole to 10 tenths. Therefore, we now have 12 tenths.



Now we can take 9 tenths away.



Next we take away (subtract) 1 whole.
Our answer is:



Repeat for other problems.

2. Use the dice from Activity 2, page 148. The numbers rolled will have to be arranged with the larger on top, the smaller on the bottom. The student then subtracts. The winner is the player

OBJECTIVE

To subtract ones and tenths written in decimal form (with regrouping)

PACING

Level A All
Level B All
Level C All

MATERIALS

fraction wheel (page 130), dials (page 147, Activity 2) or ruler strips (page 142, Activity 1)

RELATED AIDS

HMS — DM43.

SUGGESTIONS

Initial Activity Review the concept of regrouping for subtraction. Use the dials, fraction wheels, or ruler strips to reinforce the concept of subtraction of decimals. Show how the numbers can be written in the place-value chart. Emphasize the one's and tenth's place values. Also emphasize that one is equivalent to 10 tenths.

with the most correct after 10 rolls.
(Students may use calculators to check their answers.)

EXTRA PRACTICE

1. Rename.

- $4.2 =$ ___ ones ___ tenths
- $8.2 =$ ___ ones ___ tenths
- $1.4 =$ ___ ones ___ tenths
- $3.5 =$ ___ ones ___ tenths
- $6.8 =$ ___ ones ___ tenths
- $9.3 =$ ___ ones ___ tenths
- $5.4 =$ ___ ones ___ tenths
- $8.1 =$ ___ ones ___ tenths

2. Use HMS — DM43.

Challenge the class with problems such as:

3. Linda's ribbon was 4.5 m long.
She gave 1.8 m to a friend.
How much ribbon did she have left?

★ 4. Justin's rope is 16.4 m long.
Bill's rope is 8.2 m long.
Justin gave 8.8 m away.
How much rope has Justin left?

OBJECTIVE

To practise addition of ones and tenths written in decimal form (with regrouping)

PACING

Level A 1, 2 (half of each)

Level B All

Level C 1, 2 (half of each)

VOCABULARY

technical merit, artistic impression

RELATED AIDS

CALC. W/BK — 20.

BACKGROUND

Technical merit points are awarded for the exactness with which spins, turns, and jumps are done. Artistic impression points are awarded for the grace and beauty shown in the skater's program; the coordination of the skating and the music; and for originality.

SUGGESTIONS

Initial Activity You might discuss figure skating and figure-skating competitions and the current year's top contenders in Canada and the world. Discuss how points are awarded: seven judges assign points 0 to 6. The highest and the lowest are cast out and the remaining five are averaged. You may illustrate with several sets of points: 4.1 4.7 5.2 3.9 4.3 4.5 4.9. Cast out lowest and highest: 3.9 and 5.2. Add remaining five: sum = 22.5. Divide by 5 (do this for students) = 4.5. (This illustrates a need for division to be introduced later.)

ACTIVITIES

1. Make a set of triangular "Flash" cards as described in the Activity Reservoir. Use suitable decimal facts involving addition and subtraction.

2. Have students prepare a bulletin board display of some famous skaters in action.

3. Play "Down to Zero". Prepare 2 decks (about 35-50) of cards each with an instruction, such as: "+ 2.4", "- 1.5", "+ 3.0", "go to 6.0", etc. All players start with 5.0. Players take turns drawing cards, performing operations (if possible). First player to reach zero exactly, or player with lowest balance after 5 turns, is the winner.

Figure Skating and Decimals

These charts show the points for each skater in two figure skating contests. Calculate the total score for each skater. Then name the gold (first), silver (second), and bronze (third) medal winners.

1.

Name	Points for		Total Points
	Technical Merit	Artistic Impression	
Lori	4.2	4.8	9.0
Nancy	5.0	4.2	9.2
Josie	4.6	4.8	9.4
Julie	4.4	5.3	9.7
Kay	5.6	4.4	10.0
Yvonne	5.2	5.6	10.8
Sherri	5.1	5.5	10.6
Janet	5.7	5.4	11.1
Kim	4.9	5.8	10.7
Vicky	5.0	5.9	10.9

Gold: Janet
Silver: Vicky
Bronze: Yvonne

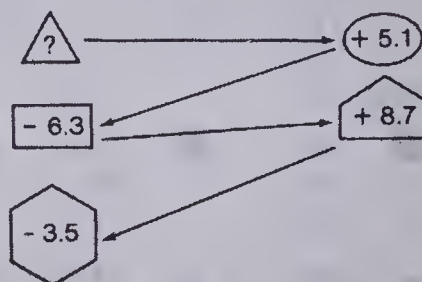


Gold: Ron
Silver: Vern
Bronze: Gary

2.

Name	Points for		Total Points
	Technical Merit	Artistic Impression	
Bruno	4.1	4.7	8.8
Teddy	4.0	4.6	8.6
Michael	5.2	3.9	9.1
Leonard	5.2	4.8	10.0
Neil	4.6	4.1	8.7
Kevin	5.8	5.7	11.5
Ron	5.9	6.0	11.9
Vern	5.9	5.9	11.8
Roy	5.7	5.9	11.6
Gary	5.9	5.8	11.7

BRAINTICKLER



The final answer is 10.

What number did I start with? 6.0

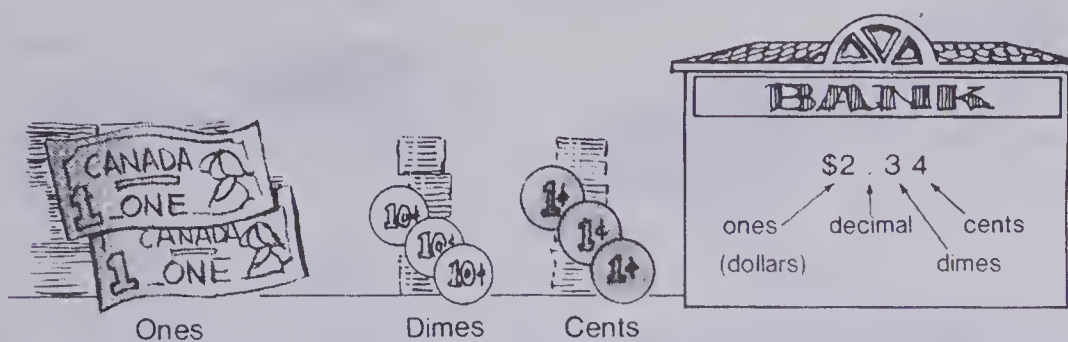
150 Practice with decimals

Using the Book Ask the students to do Exercise 1. Point out they are to add the points for each skater. Direct them to write the name of each player in their books, then to write the two scores beside the names and add. Later they have to identify the player with the most total points and the next two highest total points. After the first exercise has been completed and corrected, assign the next.

Students may use calculators to check their total points for each player or individual students can show the calculations for each skater by doing a sum at the chalkboard.

Upon completion of the page you may want to give gold, silver, and bronze awards to the students: gold — all correct; silver — one wrong; bronze — up to 5 wrong.

Dollars, Dimes, and Cents



OBJECTIVE

To use decimal notation to write dollars and cents

PACING

Level A All
Level B All
Level C 4-8

MATERIALS

play money

SUGGESTIONS

Initial Activity Put out 2 dollar bills, 3 dimes, and 4 pennies. Elicit from the students that the way we write money amounts tells us the number of one-dollar bills, the number of dimes, and the number of pennies (often there are other sets of bills and coins possible, also).

\$2.34	→ \$2.00	2 dollar bills
	→ \$0.30	3 dimes
	→ \$0.04	4 pennies

Repeat with other amounts.

\$1.79	\$4.06
\$5.10	\$0.39

Exercises How many dollars and cents?

1. \$0.67

2. \$3.51

3. \$6.07

Copy and complete.

1. \$ 6.72 = dollars dimes cents
5. \$ 4.50 = dollars dimes cents
6. \$ 2.05 = dollars dimes cents
7. \$ 0.35 = dollars dimes cents
8. \$ 9.13 = dollars dimes cents

BRAINTICKLER

Lunch at Burger Shack costs \$1.
You give the waiter 50 coins
which add up to \$1.
1 quarter, 2 dimes, 2 nickels, 45 cents
What coins did you give the waiter?

Writing decimal notation for money 151

Using the Book Show the students a dollar bill, 2 quarters, and 3 pennies. Ask what the sum of money is.

Repeat this type of activity until the students respond quickly and correctly. Do Exercise 1 with the students. They will have to find the total value of the money shown and then write the value using the dollar and cent sign.

ACTIVITIES

1. Conduct a *Read Down* using money notation. Organize it like a Spelling Bee. Divide the students into two groups. Write sums of money on the chalkboard (\$3.26), one at a time. The players from the teams take turns reading them correctly (or they may be required to specify the number of dollar bills, dimes, and pennies in that order). Those who make a mistake sit down. The team with the last students standing is the winner.

2. Prepare three lists of amounts of money. Each list contains a value written in a different way. Students are to match money of equal values. (Mix the values in each column. Here they are matched in each row.)

A	B	C
\$9.80	98 dimes	nine dollars and eighty cents
\$3.52	352 pennies	three dollars and fifty-two cents
\$7.04	7 dollar bills and 4 pennies etc.	seven dollars and four cents

3. Challenge the students with a problem card such as:

I have these coins:

What amounts can I spend without getting any change?

Answers:

1 coin — 5¢, 10¢, 25¢, 50¢
2 coins — 15¢, 30¢, 35¢, 55¢, 60¢, 75¢
3 coins — 40¢, 65¢, 80¢, 85¢
4 coins — 90¢

EXTRA PRACTICE

Copy and complete.

- \$3.57 = dollars dimes cents
- \$14.29 = dollars dimes cents
- \$8.70 = dollars dimes cents
- \$13.60 = dollars dimes cents
- \$1.08 = dollars dimes cents
- \$0.78 = dollars dimes cents

OBJECTIVE

To make change from sums up to \$10

PACING

Level A All
Level B All
Level C 3-9

VOCABULARY

yo-yo, rock band

MATERIALS

play money

BACKGROUND

There are many ways to make change. The method used here is to count from the amount of the purchase to the amount of money tendered. In stores today the automatic cash registers display the amount of change to be given the customers.

SUGGESTIONS

Initial Activity One way to make change is to count from the amount of purchase to the amount the customer gave the clerk. Have the children work with play money doing questions before assigning the page.

Review skip counting by 5's, 10's, and 25's.

ACTIVITIES

1. Have the students bring in catalogues or sale pages from newspapers. You can have the students do a number of things.

(a) Start the students with a given amount of money (\$5 bill, \$10 bill) and tell them to buy an item and calculate the change. They are to make a record.

Amount of money — \$5

Cost of (item) — \$2.25

Change: 25¢, 25¢, 25¢, \$1, \$1

(b) Repeat part (a) but have the students estimate roughly how much change they will get. Each makes a record.

Amount of money — \$10

Cost of (item) — \$3.35

Approximate change:

Between \$6 and \$7

2. Have the students find as many different ways they can of writing money (how we write a cheque, foreign money such as £, etc.). They can make a bulletin board display.

EXTRA PRACTICE

How much change?

1. Whiz-Bang Game: \$1.58
Paid: 2 one-dollar bills

Making Change

Sharon bought a kite.
She paid with 3 one-dollar bills.
How much change?



One way: \$2.65 \$2.75 \$2.85 \$2.95 \$3.00
 1 dime 1 dime 1 dime 1 nickel

She received 3 dimes and 1 nickel.
She received 35¢ change.

Exercises

How much change?

1. Carole bought a yo-yo for \$1.40.
She paid with 2 one-dollar bills.

\$1.40 \$1.50 \$1.75 \$2.00
 10¢ 25¢ 25¢

1 dime and 2 twenty-five cent coins is the change. She received 60c in change.

- Comic books: \$1.58
Paid: 1 two-dollar bill 42¢ change
2 cents, 1 dime, 1 nickel, 1 quarter
4. Ticket to movie: \$1.35
Paid: 1 five-dollar bill \$3.65 change
1 nickel, 1 dime, 2 quarters, 1 one-dollar bill, 1 two-dollar bill
6. Milk and eggs: \$3.25
Paid: 1 five-dollar bill \$1.75 change
3 quarters, 1 one-dollar bill
8. Basketball: \$8.75
Paid: 1 ten-dollar bill \$1.25 change
1 quarter, 1 one-dollar bill

- Whistle: \$2.19
Paid: 1 five-dollar bill \$2.81 change
1 cent, 1 nickel, 3 quarters, 1 two-dollar bill
5. Tickets to Rock Band Show: \$2.50
Paid: 1 five-dollar bill \$2.50 change
2 quarters, 1 two-dollar bill
7. T-shirt: \$3.49
Paid: 1 ten-dollar bill \$6.51 change
1 cent, 2 quarters, 1 one-dollar bill, 1 five-dollar bill
9. Bat: \$6.20
Paid: 1 ten-dollar bill \$3.80 change
1 nickel, 3 quarters, 1 one-dollar bill, 1 two-dollar bill

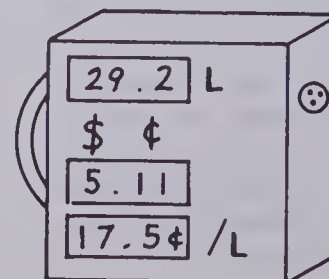
152 Making change from sums up to \$10

Using the Book Discuss the display. Ask if there is another way to make 35¢ change.

Do Exercises 1-3 with the students and emphasize the method of counting from the cost of purchase to the amount the customer paid.

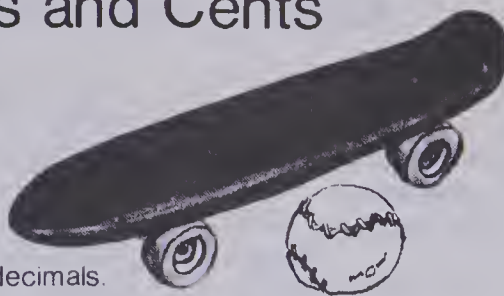
As an extension, have Level C students make change using the fewest number of coins possible.

2. Never-Dry pen: \$2.35
Paid: 1 one-dollar bill
and 1 two-dollar bill
3. John's father got gas.
How many litres were bought?
How much did 1 L cost?
How much did the gas cost?
He paid with 6 one-dollar bills.
How much change?



Adding Dollars and Cents

Mary bought a skateboard for \$21.85.
She also bought a ball for \$3.32.
How much did she pay altogether?



When we add money we must line up the decimals.

$$\begin{array}{r} \$21.85 \\ + 3.32 \\ \hline 7 \end{array}$$

$$\begin{array}{r} \$21.85 \\ + 3.32 \\ \hline .17 \end{array}$$

$$\begin{array}{r} \$21.85 \\ + 3.32 \\ \hline \$25.17 \end{array}$$

Adding dollars and cents is like adding whole numbers. *Remember the decimal point.*

Mary paid \$25.17.

We place a dollar sign at the top of the column and in the answer.

Exercises

Add.

$$\begin{array}{r} \$5.32 \\ + 3.11 \\ \hline \$8.43 \end{array}$$

$$\begin{array}{r} 5. \$11.46 \\ + 9.34 \\ \hline \$20.80 \end{array}$$

$$\begin{array}{r} 9. \$26.58 \\ + 3.42 \\ \hline \$30.00 \end{array}$$

$$\begin{array}{r} \$16.28 \\ + 8.15 \\ \hline \$24.43 \end{array}$$

$$\begin{array}{r} 6. \$28.33 \\ + 10.09 \\ \hline \$38.42 \end{array}$$

$$\begin{array}{r} 10. \$47.86 \\ + 3.24 \\ \hline \$51.10 \end{array}$$

$$\begin{array}{r} \$23.56 \\ + 16.68 \\ \hline \$40.24 \end{array}$$

$$\begin{array}{r} 7. \$10.09 \\ + 9.93 \\ \hline \$20.02 \end{array}$$

$$\begin{array}{r} 11. \$64.19 \\ + 5.21 \\ \hline \$69.40 \end{array}$$

$$\begin{array}{r} 4. \$62.33 \\ + 4.98 \\ \hline \$67.31 \end{array}$$

$$\begin{array}{r} 8. \$17.43 \\ + 2.57 \\ \hline \$20.00 \end{array}$$

$$\begin{array}{r} 12. \$71.89 \\ + 8.98 \\ \hline \$80.87 \end{array}$$

Adding money, 2 addends 153

Using the Book Have students examine the display and note the placement of the dollar signs in the question. Emphasize the alignment of the decimals.

Use the chalkboard and have students give a second example. Have one or more students do the example.

Emphasize the concept of regrouping, i.e., in the penny's column, we get 11 pennies which is 1 dime and 1 penny. We write 1 penny in the sum and add the 1 dime to the dime's column. Then we get 12 dimes in the dime's column, which is 1 dollar and 2 dimes. We write the 2 dimes in the sum and add the 1 dollar to the dollars.

$$\begin{array}{r} \$3.57 \\ + 2.64 \\ \hline \$6.21 \end{array}$$

OBJECTIVE

To add dollars and cents involving 2 addends

PACING

Level A All
Level B All
Level C All

RELATED AIDS

BFA PROB. SOLVING LAB II — 99-101, 185, 186, 225, 226.

SUGGESTIONS

Initial Activity Review addition of whole numbers and addition of decimals. Emphasize that when adding decimals we must always align the decimals one above the other.

ACTIVITIES

1. Students may enjoy finding the history and development of money as a means for purchasing goods. Have students use the library to write a report or make a time-line showing their findings.

2. Have the students bring in catalogues or sale pages from newspapers. Each child should list two (or three) items, the page number it is on, and the total price. Then have the students exchange papers and check for accuracy.

EXTRA PRACTICE

Add.

$$\begin{array}{r} 1. \$33.45 \\ + 12.38 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \$54.75 \\ + 26.98 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \$44.68 \\ + 37.75 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \$42.35 \\ + 29.88 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \$72.68 \\ + 18.53 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \$64.75 \\ + 48.85 \\ \hline \end{array}$$

$$\begin{array}{r} 7. \$58.84 \\ + 92.49 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \$68.02 \\ + 31.98 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \$42.37 \\ + 57.63 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \$77.77 \\ + 22.23 \\ \hline \end{array}$$

$$\begin{array}{r} 11. \$61.37 \\ + 52.55 \\ \hline \end{array}$$

$$\begin{array}{r} 12. \$32.11 \\ + 84.33 \\ \hline \end{array}$$

$$\begin{array}{r} 13. \$11.11 \\ + 88.89 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \$22.33 \\ + 55.57 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \$44.54 \\ + 55.45 \\ \hline \end{array}$$

16. Mark bought a skill saw for \$32.45.
A blade cost \$6.75.
How much altogether?

17. Jane bought a hedge clipper for \$22.65.
A set of gardening tools cost \$18.50.
How much altogether?

OBJECTIVE

To add dollars and cents involving 3 addends

PACING

Level A 1-8, 11

Level B 2-11

Level C 2-11

RELATED AIDS

BFA COMP LAB II — 8.

SUGGESTIONS

Initial Activity Review addition of whole numbers using three addends. Emphasize that, once the decimal points have been aligned, adding dollars and cents is done using the same method.

ACTIVITIES

1. Have students find the name and value of coins and bills used in other countries. The newspaper often gives the value of foreign currency in relation to the Canadian dollar.

2. You may wish to set up a store in your classroom, at which children may purchase items. Students should learn to estimate the total cost of two or three items.

3. Make up a list of values for the typical items found in the children's desks: desk — \$47.50, workbooks — \$0.45, ruler — \$0.33, textbooks — \$6.50 each, etc. Children might enjoy:

- listing desk contents,
- finding their values from the chart,
- computing the "value" of their desks and contents.

EXTRA PRACTICE

Add.

1. $\$1.67 + \0.58

2. $\$4.99 + \2.89

3. $\$2.48 + \$0.50 + \$2.78$

4. $\$1.89 + \$1.33 + \$2.98$

5. $\$3.23 + \$10.56 + \$0.08$

6. $\$8.69 + \$1.09 + \$2.22$

7. $\$4.12$	★8. $\$34.51$
1.89	20.69
+ 0.38	+ 10.89
<hr/>	<hr/>

★9. $\$0.51$	★10. $\$16.51$
21.89	11.61
+ 31.21	+ 22.39
<hr/>	<hr/>

Solve.

★11. $\$16.31 + \$23.42 = \blacksquare$

★12. $\$17.89 + \$28.43 = \blacksquare$

Adding More Dollars and Cents

Louis bought:

	Add.			
A superduper hamburger	\$2.00	\$2.00	\$2.00	\$2.00
A milkshake	\$0.65	0.65	0.65	0.65
French fries	\$0.75	+ 0.75	+ 0.75	+ 0.75
		<hr/>	<hr/>	<hr/>
How much altogether?		0	.40	\$3.40

Louis paid \$3.40.

Adding dollars and cents is like adding whole numbers.

Remember to line up the decimals.

Exercises

Add.

● $\$3.21$
1.69
+ 0.33

\$5.23

● $\$3.29$
0.56
+ 1.87

\$5.72

3. $\$12.35$
4.31
+ 2.65

\$19.31

4. $\$0.75$
11.65
+ 3.00

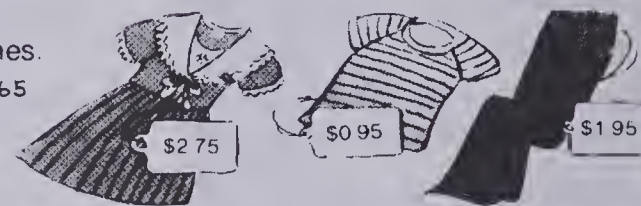
\$15.40

● $\$1.46 + \$0.51 + \$1.62 = \blacksquare \3.59 6. $\$1.39 + \$0.68 + \$2.89 = \blacksquare \4.96

7. $\$6.23 + \$1.56 + \$0.09 = \blacksquare \7.88 8. $\$0.69 + \$0.09 + \$2.23 = \blacksquare \3.01

9. $\$5.41 + \$3.27 + \$0.10 = \blacksquare \8.78 10. $\$1.79 + \$0.75 + \$3.31 = \blacksquare \5.85

11. Sherri bought these doll clothes.
How much did she pay? \$5.65



154 Adding money, 3 addends

Using the Book Most students will need no help after having done page 153. If some students need help, work with them in small groups assembled in a corner or at a desk. Here use play money to reinforce the concepts.

Encourage students to do the addition in Exercises 5-10 without rewriting the questions in vertical form. Some students will find it is necessary to rewrite the questions before doing the addition.

13. Gordon bought the two train cars.
How much altogether?



\$8.65



\$3.45

Subtracting Dollars and Cents

When we subtract money we must line up decimals.

Subtract.	Step 1	Step 2	Step 3	Step 4
	$\begin{array}{r} \$3.24 \\ - 0.89 \\ \hline \end{array}$	$\begin{array}{r} \overset{1\ 14}{\$3.24} \\ - 0.89 \\ \hline \end{array}$	$\begin{array}{r} \overset{2\ 11\ 14}{\$3.24} \\ - 0.89 \\ \hline \end{array}$	$\begin{array}{r} \overset{2\ 11\ 14}{\$3.24} \\ - 0.89 \\ \hline \end{array}$
		$\begin{array}{r} .5 \\ \hline \end{array}$	$\begin{array}{r} .35 \\ \hline \end{array}$	$\begin{array}{r} \$2.35 \\ \hline \end{array}$

Subtracting dollars and cents is like subtracting whole numbers.

Exercises

Subtract.

1. $\begin{array}{r} \$3.58 \\ - 1.23 \\ \hline \end{array}$	2. $\begin{array}{r} \$5.67 \\ - 0.54 \\ \hline \end{array}$	3. $\begin{array}{r} \$2.26 \\ - 0.59 \\ \hline \end{array}$	4. $\begin{array}{r} \$4.13 \\ - 2.67 \\ \hline \end{array}$	5. $\begin{array}{r} \$8.51 \\ - 5.69 \\ \hline \end{array}$
6. $\begin{array}{r} \$9.02 \\ - 4.92 \\ \hline \end{array}$	7. $\begin{array}{r} \$4.59 \\ - 1.23 \\ \hline \end{array}$	8. $\begin{array}{r} \$2.37 \\ - 0.57 \\ \hline \end{array}$	★ 9. $\begin{array}{r} \$17.36 \\ - 12.57 \\ \hline \end{array}$	★ 10. $\begin{array}{r} \$26.00 \\ - 12.37 \\ \hline \end{array}$

Solve.

- ★ 11. $\$19.21 - \$9.84 = \blacksquare \$9.37$ ★ 12. $\$26.14 - \$19.87 = \blacksquare \$6.27$
13. Eric bought a mechano set.
Regular price was \$15.67.
He paid \$9.87 on sale.
How much did he save? \$5.80
14. Carmen had \$14.35.
She paid \$8.67 for a camping kit.
How much did she have left? \$5.68

OBJECTIVE

To subtract dollars and cents (with regrouping)

PACING

Level A 1-8, 13, 14
Level B 1-8, 13, 14
Level C 3, 6-14

VOCABULARY

mechano

MATERIALS

play money

RELATED AIDS

HMS — DM44.
BFA COMP LAB II — 21.
BFA PROB. SOLVING LAB II —
106, 110, 111, 187, 188, 227, 228.

SUGGESTIONS

Initial Activity Review the concept of regrouping for subtraction of whole numbers. Emphasize that regrouping for subtraction using dollars and cents is done in the same manner. When necessary change one dollar to ten dimes and/or one dime to ten pennies.

ACTIVITIES

1. You may feel it worthwhile to give the students a set amount of money, such as \$3.54 as 3 dollars, 5 dimes, and 4 pennies. Then ask them to take away \$1.68, by following the procedure set out in Using the Book, page 155. Show the written problem and solution simultaneously.

2. Tell the students that they each have \$20.00. Then using catalogues or sale flyers from local stores, they are to select, cut out items, and write a number story for the amount the items cost and the amount of money left over. They can mount the pictures and number stories suitable for display on the bulletin board.

3. Have students write 4 completed subtraction exercises (involving dollars and cents) with errors in 2 and the other 2 correctly completed. The students exchange exercises and check the work by writing addition exercises and adding. The errors are to be corrected.

EXTRA PRACTICE

HMS — DM44.

Using the Book If some students require help, work with them alone or in small groups assembled in a corner or at a desk. Use play money to illustrate the problem in the display in this way:

- The decimals must be aligned.
- Since 9 pennies cannot be taken away from 4 pennies, a dime is traded in for 10 pennies. (Show the trading both using play money and in written form.) We now take 9 pennies away from 14 pennies, leaving 5 pennies.
- Since 8 dimes cannot be taken from 1 dime, show a dollar being traded for 10 dimes. We now take 8 dimes from 11 dimes leaving 3 dimes.
- In all we have left, 2 dollars, 3 dimes, and 5 pennies.

Repeat for another question with the student explaining what is done in each step.

OBJECTIVE

To solve multi-step problems involving money

PACING

Level A 1-4

Level B 1-4

Level C All

VOCABULARY

stereo, savings

RELATED AIDS

CALC. W/BK — 13.

SUGGESTIONS

Initial Activity Discuss some reasons for comparison shopping. All sales aren't really bargains. Also talk about the worth of advertising. People will often buy things they don't need simply because they are on sale. Have students explain the method for finding total savings when they buy things at sale prices. Students will need to be able to find the sum of 3 addends.

Assign:

\$3.95	\$55.90	\$72.31
2.59	32.51	41.35
+ 1.63	+ 14.67	+ 27.15

$\$31.51 + \$7.03 + \$3.75$

$\$6.74 + \$16.34 + \$7.31$

ACTIVITIES

1. Have students find a newspaper ad that indicates original value and sale price. Have them find the savings on each article. Depending on the nature of the ad, prepare a menu from food purchased on sale or buy a change of clothes from sale items. Find the total savings.

2. Use a catalogue from a discount store that lists suggested retail price and "our price". Find the savings on various articles. Furnish a bedroom and find the total savings.

3. Students may find it interesting to invite a clerk or cashier to talk about the problems, rewards, mathematics skills encountered on the job.

EXTRA PRACTICE

(Refer to text for item prices.)

- ★1. John had \$20.00.
He bought a Rock Star record and a Star Flecs record.
How much money did he have left?
- ★2. Mother gave John and Mary \$100.00.
They bought for their father the

Practice

Martin bought the stereo and the Rock Stars record. What did he pay?

$$\begin{array}{r} 11 \\ \$71.28 \\ + 3.98 \\ \hline \$75.26 \end{array}$$

He paid \$75.26.



Exercises

1. Melba bought:
Disco Deks
Star Flecs
Rock Stars.
What did she pay? \$13.28
2. What is the savings on
(a) Rock Stars record? \$2.14
(b) Disco Deks record? \$2.54
(c) Star Flecs record? \$1.28
3. What is the total sale price for Rock Stars and Disco Deks? \$8.16
4. What is the total sale price for Disco Deks and Star Flecs? \$9.30
- ★5. What is the savings on the stereo? \$22.82
- ★6. What is the total sale price of the three records and the stereo? \$45.66

156 Money, solving problems

Using the Book Have the students study the display and indicate orally the information given there. Have a student read Exercise 1. Discuss *how* the answer is to be found. Do *not* do the question. Then have a student read Exercise 2. Elicit from the students *how* the answer is to be found. Point out that the students have to decide what steps are necessary to find the answers. Also these questions have no key words that "tell" what operation is to be used but rather the questions must be "understood" to determine what is to be done.

Assign the exercises.

stereo, a Rock Star record, and a Disco Deks record.
How much money did they have left?

- ★3. Mr. Wright missed the sale and had to pay the regular price.
He bought the stereo and all three records.
How much more did he pay than if he had bought them on sale?

Hamburger Stand Operator

- menu -			
Hamburger	\$0.90	Teenburger	\$1.19
Hot dog	\$0.50	Orange drink	\$0.35
Milk shake	\$0.65	Apple	\$0.20



The operator of a hamburger stand must add quickly and make change quickly.

Exercises

What change?

- | | |
|--|--|
| 1. 1 hamburger 2 dimes, 1 quarter,
1 shake 1 one-dollar bill 1 two-dollar bill
Paid: 1 five-dollar bill \$3.45 change | 2. 1 hot dog 1 nickel, 1 dime,
1 orange drink 1 one-dollar bill
Paid: 2 one-dollar bills \$1.15 change |
| 3. 1 teenburger 1 cent, 1 dime,
1 apple 2 quarters
Paid: 2 one-dollar bills \$0.61 change | 4. 1 teenburger 1 cent, 2 dimes, 1 quarter,
1 orange drink 1 one-dollar bill, 1 two-dollar bill
Paid: 1 five-dollar bill \$3.46 change |
| 5. 1 hot dog 1 dime, 3 quarters, 1 one-
1 milk shake dollar bill, 1 two-dollar bill
Paid: 1 five-dollar bill \$3.85 change | 6. 2 hot dogs 1 nickel, 1 quarter, 1 one-
2 orange drinks dollar bill, 1 two-dollar bill
Paid: 1 five-dollar bill \$3.30 change |
| 7. What could you buy if you had
\$1.00? What change would
you get? Answers will vary | 8. What could you buy if you had
\$2.00? What change would
you get? Answers will vary. |
| 9. What items cost exactly \$1.25?
hamburger and orange drink | 10. What items cost exactly \$1.54?
teenburger and orange drink |

Career, solving money problems 157

Using the Book Some students can proceed directly into the exercises. With others you may wish to use play money and ask the students to give you the correct change when playacting for the specific questions.

OBJECTIVES

To calculate the change in purchasing items

To solve money problems

PACING

Level A 1-8

Level B All

Level C 6-10

VOCABULARY

operator

RELATED AIDS

CALC. W/BK — 13.

SUGGESTIONS

Initial Activity See the Career Awareness section in the Chapter Overview, page 128. Discuss the nature of the work of a Hamburger Stand Operator. Elicit from the class how the operator uses mathematics. Discuss other careers that are related. Some answers may be the delivery man, the meat wholesaler, the baker, the butcher, the rancher, the farmer, etc.

ACTIVITIES

1. Set up a hamburger stand using pictures of food and play money. Have students alternate as clerk and customer.

2. Get a menu from one of the fast food outlets. Order a meal and find the total cost for 1 person, for a family of 4, etc.

3. Have the students list the reasons one hamburger stand may do well, have a steady stream of customers, make a good profit, etc. while another may have few customers and be operating at a loss. (Some reasons may relate to the location, quality of service, food, and variety of the menu.)

EXTRA PRACTICE

(Refer to text for item prices.)

- Which 3 different items cost exactly:
 - \$1.05? (Hot dog, orange drink, apple)
 - \$2.04? (teenburger, orange drink, hot dog)
 - \$1.75? (hamburger, milkshake, apple)
- Which items cost exactly:
 - \$2.39? (teenburger, orange drink, apple, milk shake)
 - \$2.25? (hamburger, hot dog, milk shake, apple)
 - \$3.09? (teenburger, hamburger, orange drink, milk shake)

OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

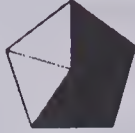
- Level A All
- Level B All
- Level C All

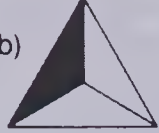
RELATED AIDS

HMS — DM45.

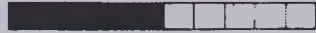
Chapter Test


1. Write the fraction for the red part.

(a)  $\frac{3}{5}$

(b)  $\frac{1}{3}$

2. Write the decimal for the red part.

(a)  0.5

(b)  0.7

3. Write the decimal.

(a) $\frac{13}{10}$
 $\frac{10}{13}$

(b) $\frac{6}{10}$
0.6

(c) $1\frac{7}{10}$
1.7

4. How many ones and how many tenths?

(a) 2.7
2 ones and 7 tenths

(b) 0.2
0 ones and 2 tenths

(c) 1.0
1 one and 0 tenths

5. Add.

(a) $\begin{array}{r} 0.3 \\ + 0.4 \\ \hline 0.7 \end{array}$

(b) $\begin{array}{r} 1.4 \\ + 2.7 \\ \hline 4.1 \end{array}$

(c) $\begin{array}{r} \$6.15 \\ + 1.85 \\ \hline \$ 8.00 \end{array}$

(d) $\begin{array}{r} \$11.23 \\ + 2.39 \\ \hline \$ 13.62 \end{array}$

6. Subtract.

(a) $\begin{array}{r} 0.9 \\ - 0.2 \\ \hline 0.7 \end{array}$

(b) $\begin{array}{r} 4.2 \\ - 0.9 \\ \hline 3.3 \end{array}$

(c) $\begin{array}{r} \$5.45 \\ - 1.23 \\ \hline \$ 4.22 \end{array}$


(d) $\begin{array}{r} \$18.03 \\ - 9.78 \\ \hline \$ 8.25 \end{array}$

What change?

7. Bought: Milk shake \$0.85
Orange drink \$0.65
Paid: two-dollar bill \$0.50 change
2 quarters

8. Bought: Super Jet Kit \$1.85
Glue \$0.75
Paid: five-dollar bill \$2.40 change
(nickel, 1 dime, 1 quarter, 1 two-dollar bill)

9. How many decimetres long?



Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 128).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1	A	129-131
2, 3, 4	B	132-133, 135, 146
9	C	136-138, 140
5, 6	D	139, 141, 143, 147-149
7, 8	E	152
5, 6	F	153-155

Cumulative Review

1. Multiply.

(a) 7×8 56	(b) 9×6 54	(c) 25×1000 ^{25 000}	(d) 60×100 6000
(e) $\begin{array}{r} 26 \\ \times 3 \\ \hline \end{array}$	(f) $\begin{array}{r} 87 \\ \times 6 \\ \hline \end{array}$	(g) $\begin{array}{r} 73 \\ \times 9 \\ \hline \end{array}$	(h) $\begin{array}{r} 45 \\ \times 8 \\ \hline \end{array}$
78	522	657	360

2. Divide.

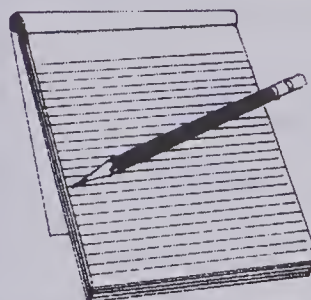
(a) $81 \div 9$ 9	(b) $48 \div 8$ 6	(c) $3000 \div 100$ 30	(d) $700 \div 10$ 70
(e) $6 \overline{)132}$ 22	(f) $5 \overline{)125}$ 25	(g) $4 \overline{)280}$ 70	(h) $9 \overline{)246}$ 27R3

3. Write the numeral: two thousand, fifty-six. 2056

4. Name an object that is about (a) 2 m long (b) 20 cm.

5. Estimate the length in millimetres:

(a) _____ 15 mm (b) _____ 30 mm



Solve.

6. Sharing: 52 apples

6 people

How many apples each 8

and how many left over? 4 left over

7. Draw a picture and solve.

Mark is 1.3 m tall.

Susie is 0.9 m tall.

How much taller is Mark? 0.4 m

OBJECTIVE

To review and test selected concepts and skills previously covered

PACING

Level A All

Level B All

Level C All

Using the Book This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1(a), 1(b)	77
1(c), 1(d)	79
1(e)-1(h)	87
2(a), 2(b)	109
2(c), 2(d)	107
2(e)-2(h)	119
3	33
4	48
5	49
6	112
7	148

CHAPTER 6 OVERVIEW

This chapter applies some of the skills learned in previous chapters through problem solving and measurement investigations.

Problem solving is extended to include skills such as deciding on the appropriate operation, 2-step problems, solving problems using information in a paragraph, and drawing diagrams to solve problems.

Measurement applications include drawing to scale, estimating, interpretation of distances on maps, perimeter, and introduction of the millilitre.

OBJECTIVES

- A To measure to the nearest centimetre and to the nearest 10 mm
- B To calculate the perimeter of various polygons
- C To calculate the average (arithmetic mean of a set of numbers)
- D To find distances on a map using a specified scale
- E To solve problems
- F To estimate various units of measure

BACKGROUND

The problem-solving pages are designed to apply a student's arithmetic, reading, and thinking skills. They are also designed with a social context in mind, i.e., to develop a greater awareness of the people, places, and activities which help to maintain a positive community.

An essential aspect of problem solving is deciding what operation(s) to use. To do this the student must interpret the question or parts of the question to decide the critical issues such as: are we putting together various different items (addition) or items of the same kind (multiplication); are we finding differences (subtraction) or separating something into equal parts (division)? For many students, these points need to be brought out through their discussions under teacher guidance.

Measurement investigations are derived from real-

life situations. Calculations for perimeter, averages, and rounding are based on generalizations rather than formulas.

MATERIALS

centimetre rulers
metre sticks
scales
paper
scissors
100 m cord or trundle wheel
clock or stopwatch
junk containers
litre and millilitre containers

CAREER AWARENESS

Gas Station Owner [163]

A gas station owner is responsible for providing service and repairs to vehicles. These vehicles may belong to regular customers, or to travellers who find themselves stranded on the highway. Most drivers stop at a gas station for fuel, while others stop for needed repairs to their cars, trucks, or motorcycles. For this reason a station owner must know a lot about many different kinds of vehicles.

The owner, who is often a qualified mechanic, must be able to interpret a customer's description of what is wrong. For example, a customer may say, "There is a terrible scraping sound when I start the car!" The mechanic's intuition and background experience is often verified by testing equipment which is used to pinpoint mechanical problems.

Most gas stations are prepared to handle routine maintenance (oil changes, lubrication, etc.) and more difficult repairs too. The owner tries to book in repairs in an organized manner to keep his/her helpers busy. Customers are usually charged on the cost of the parts replaced plus time taken to install or repair the parts.

Cooksville Cleanup!



1. Grover's Hardware store donated 265 plastic garbage bags for the cleanup. Tony's Grocery Store donated 298 bags.
How many bags were donated altogether? 563
2. The Wolf Patrol from the Cooksville Boy Scouts collected 42 old car tires from a vacant lot.
The Raven Patrol collected 27 tires.
How many more tires were collected by the Wolf Patrol than the Raven Patrol? 15
3. Students from Cooksville Elementary School helped to fill 300 containers with newspapers and 163 containers with glass bottles.
How many more containers were filled with newspapers than with bottles? 137
4. The Cooksville Girl Guides planted 114 pine seedlings and 87 spruce seedlings in the Cooksville Park.
How many seedlings were planted altogether? 201
5. Cooksville has 120 traffic signs.
The Streets Department painted 76 of them.
How many traffic signs still need painting? 44

Addition and subtraction problems 161

Using the Book Review the four questions of Professor Q (pages 10-11) and the problem-solving format that you have established. If members of your class have reading difficulties, use this page for a reading exercise. Discuss with the class the words or meanings that tell them whether they should add or subtract.

Ask those students needing help with a particular problem: "Are we taking, combining, or putting things together? What words tell us this? (altogether)" "What operation do we use when we put things together? (add)" "Are we looking for differences? What words tell us this? (How many more . . . ; How many still need . . .)" "What operation do we use to find the differences? (subtraction)"

OBJECTIVES

To solve problems involving addition and subtraction

PACING

Level A All
Level B All
Level C All

VOCABULARY

campaign, citizen, volunteers, donated, seedlings, traffic signs

SUGGESTIONS

Initial Activity This page could ideally be timed to coincide with a school cleanup. Discuss with children ways in which the environment is damaged and how it can be protected. Suggest that students bring newspaper or magazine articles that relate to the environment.

ACTIVITIES

1. Students might wish to conduct some research about local problems relating to the environment. Municipal officials and representatives from agencies that monitor the environment could be invited to speak to the class about pollution problems and some possible solutions.

2. Students may wish to illustrate ways to keep a clean school, school yard, and community. Display some of the artwork.

3. Have the students identify problems associated with a neglected community.

OBJECTIVE

To solve problems involving multiplication and division

PACING

Level A 1-5
Level B All
Level C All

VOCABULARY

insulation, electrician, shingles, sod

RELATED AIDS

BFA PROB. SOLVING LAB II—
47, 174.

SUGGESTIONS

Initial Activity Students might wish to make a list of all the occupations that are involved in the construction of a house. A local contractor would be a valuable resource in compiling such a list. Discuss with the children some of the main responsibilities associated with the occupations.

ACTIVITIES

1. A representative from a development company could be invited to describe how a new subdivision is planned and built.

2. Pictures of new houses and house plans from newspapers and magazines could be used as a bulletin-board display. Employ metric units where appropriate.

3. Students may enjoy a trip to a building site if one is available. Arrange this with a building foreman. Each student should write a word problem for the other students to do.

4. Children may benefit from practice in choosing the correct operation. Prepare a number of cards, each containing one single step word problem (problems cut and pasted from old textbooks are ideal). Task is to sort (not solve) the problem cards and place them into correct container (envelopes, boxes) appropriately labelled “ \times ”, “ \div ”, “ $+$ ”, or “ $-$ ”. Have a second person check, then reshuffle cards.

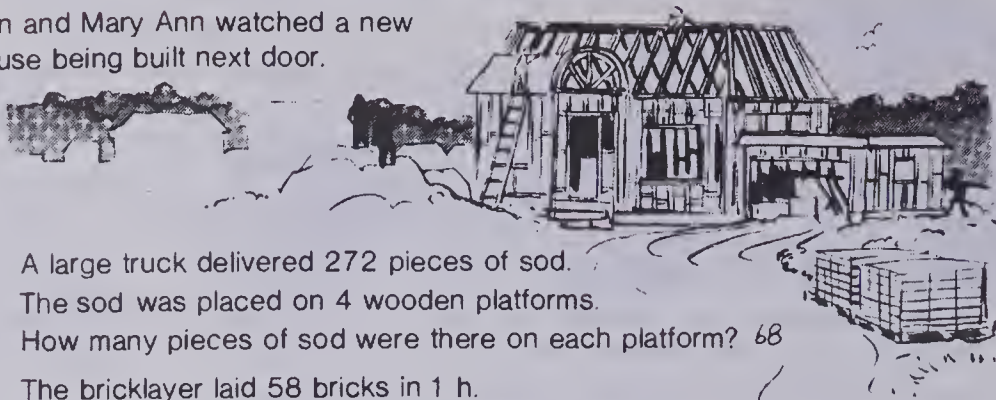
EXTRA PRACTICE

- ★1. Workers unloaded 12 doors, 36 windows, and 2 staircases.
Each worker unloaded 9 windows.
How many workers were there?
2. The shingles were carried to the roof by 4 workers.
Each bundle of shingles has a mass of 40 kg.

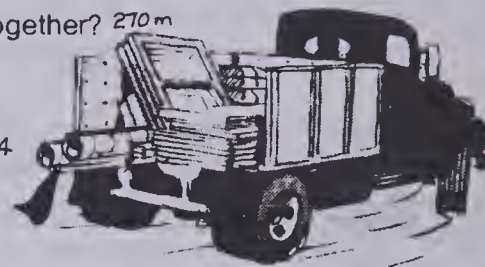
There are 8 bundles.
What is the total mass of the shingles?

The House Next Door

Ron and Mary Ann watched a new house being built next door.



1. A large truck delivered 272 pieces of sod.
The sod was placed on 4 wooden platforms.
How many pieces of sod were there on each platform? 68
2. The bricklayer laid 58 bricks in 1 h.
How many bricks could he lay in 8 h? 464
3. The electrician brought 6 boxes of wire.
There were 45 m of wire in each box.
How many metres of wire were there altogether? 270 m
4. The plumber brought 84 pieces of pipe.
There were 6 pipes in every bundle.
How many bundles of pipe were there? 14
5. Insulation was delivered in 18 bags.
There were 8 pieces in each bag.
How many pieces of insulation were delivered altogether? 144
6. The roofer brought 9 bundles of shingles, with 35 shingles in each bundle.
How many shingles were there altogether? 315
7. The lumber company cut 219 wall supports and put them in bundles of 8.
How many bundles could be made? 27
How many wall supports would be left over? 3

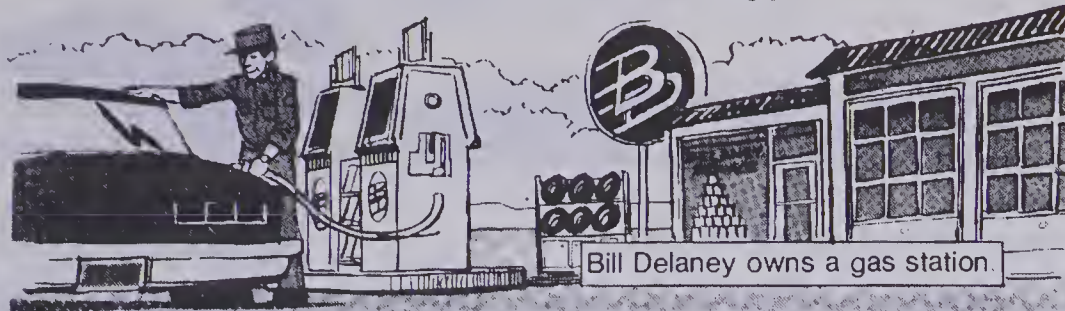


162 Multiplication and division problems

Using the Book Discuss each problem with those students needing help to develop the reason the required operation is used. Have the students take turns explaining in their own words what the problems are about. A student might say, “We have a lot of pieces of sod in 4 piles. We want to know how many pieces in each pile, so we divide.”

Some students will need cues: “Are we putting something into separate piles?” “Are we repeating something?” “Are we putting things of equal sizes together?”

Gas Station Owner



- Mr. Delaney gives 6 free juice glasses to every customer who has a car tune-up. 85 customers had tune-ups.
How many glasses did he give away? 510
- Mr. Delaney sold 28 627 L of gas on Friday and 32 516 L on Saturday.
How many more litres did he sell on Saturday than Friday? 3889 L
- Mrs. Northwood paid \$4.99 to have her car greased, \$8.00 for gas, and \$10.56 for new spark plugs.
How much did Mrs. Northwood pay altogether? \$23.55
- Mr. Delaney had 107 cans of "Super Oil".
He wanted to put 4 cans in each plastic bag for a special sale.
How many plastic bags did he need? 26
How many cans of oil did he have left over? 3
- Last year Mr. Delaney sold 187 "Super Tread" tires.
This year he sold 214.
How many more tires did he sell this year than last? 27
- Customers who take their cars through the car wash receive a free road map.
216 cars went through last week and 195 went through this week.
How many road maps were given away? 411

Problem solving — deciding on the operation 163

Using the Book Ensure all the students can read the questions. Inform the students that they will have to decide whether they are to add, subtract, multiply, or divide. See Using the Book, pages 161 and 162, for suggestions. You may allow the students to work on their own, giving assistance on an individual basis. Encourage students having difficulties to look for clue words or meanings.

OBJECTIVE

To choose the appropriate operation and then solve word problems

PACING

Level A 1, 3-5
Level B All
Level C All

VOCABULARY

tune-up, greased

RELATED AIDS

CALC. W/BK — 9.

SUGGESTIONS

Initial Activity Discuss with the students the occupation of a gas station owner, using the Career Awareness notes in the Chapter Overview (page 160).

ACTIVITIES

1. Invite a gas station owner to speak to the class. Prepare the class in advance by having them write questions they will ask the owner. The owner might describe the most difficult, the funniest, the most dangerous problem he/she ever solved.

2. Ask the students to give as many examples as they can think of to illustrate how a station owner uses mathematics. (Don't forget geometry!)

3. Ask the students to identify units of measurement that a gas station owner might use. They should tell where each unit would be used and the sizes involved in each case.

4. See the Choosing the Correct Operation Activity on page 162 (Activity 4).

5. Make a large square playing board composed of 16 smaller squares. Cut out 4 squares, 4 circles, 4 triangles, and 4 diamonds. Number each shape 1, 2, 3, and 4. Place the squares on the playing board as shown. Challenge the players to place the other shapes on the board so no similar shapes or numbers may be in the same row, column, or diagonal.

2	1	4	3
3	4	1	2
1	2	3	4
4	3	2	1

OBJECTIVE

To introduce the concept of average

PACING

Level A All
Level B All
Level C 3

VOCABULARY

average

MATERIALS

counters, bottle caps, buttons, etc.

RELATED AIDS

CALC. W/BK — 10.

SUGGESTIONS

Initial Activity Provide groups of 2, 3, or 4 students with counters. Each student in the group is to take some of the counters (don't share equally at this point, but see that the number given to a group is a multiple of the number in the group). Example: In a group of students A, B, C give A 3, B 7, and C 2 (12 counters altogether—12 is a multiple of 3). Now ask them to share equally the counters (they each get 4). How many are there altogether? How many does each get? Say, "The average is 4."

ACTIVITIES

1. To assist students to discover the short cut for averaging or to confirm their guess, have the students line up a set of blocks or buttons in a row (for example, 12) and then make various sets of pairs of rows whose total is twelve blocks (ten and two, four and eight, six and six) noting each time the average number of blocks per row. Repeat the activity making sets of three rows from the twelve blocks.

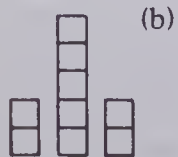
2. Ask the students to list examples where averages might be used (average number of centimetres of snow per day in a week, average number of students absent per day in a week, etc.).

EXTRA PRACTICE

Display a problem such as:

Is there a short way to find the average of these?

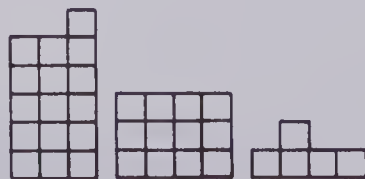
(a)



(b)



(c)



Sharing

Donna had 4 chocolates.
Michael had 8 chocolates.
They shared the chocolates evenly.
Each received 6 chocolates.



Donna's

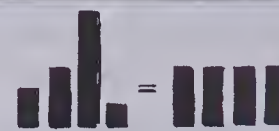


Michael's

To find an **average** means to even out the amounts.



Average = 5



Average = 3

Exercises

1. Even out the amounts. Draw the results.



3



5



(c)

3



(d)

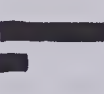
3



2. Find the average number of pieces of chocolate.

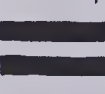


5



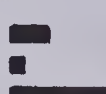
(b)

12



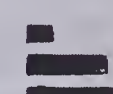
(c)

5



(d)

5



3. Share evenly.

(a) Nancy

9 marbles

Tim

3 marbles

6 marbles

(b) Phillip

10 candies

Shawn

1 candy

Brenda

4 candies

5 candies

Using the Book Illustrate the display using buttons or counters. Emphasize in each instance that we "even out" the amounts or numbers of counters. Conclude each instance with "The average is ____."

Have the students do each of Exercises 1 and 2 using counters. Elicit from the students what they are achieving (evening out or finding the average).

Encourage the students to find a "quick way" to calculate the average *but* do not tell them nor should you let those who figure it out tell the others.

Dividing for Average

Find the average of these three.



Cut one piece the length of the three.

Fold into three even pieces.

Average length = 5 cm.

$$\text{Short cut: } 2 + 4 + 9 = 15$$

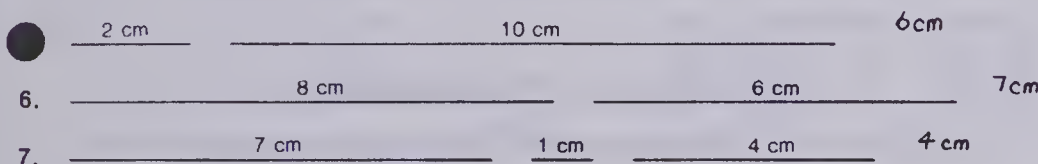
$$15 \div 3 = 5$$

Exercises

Cut and fold to find the averages.



Use the short method. Use your ruler.



Averages 165

Using the Book Have the students cut out paper strip lengths of 4 units and 6 units as shown in Exercise 1. Ask them to make one strip equal to the length of the two others. Then fold evenly and cut.

Some students will have to cut and fold for Exercises 2-4.

For Exercises 5-7, those students who have not yet discovered the short cut for finding average (add and divide) will have to be shown.

OBJECTIVE

To introduce the concept of dividing to find the average

PACING

Level A All

Level B All

Level C 1, 3-5, 7

MATERIALS

paper, scissors, centimetre graph
paper cut in strips

RELATED AIDS

HMS—DM37.

CALC. W/BK—10.

SUGGESTIONS

Initial Activity Have the students repeat the illustration in the display. Using 1 cm graph paper, have the students cut strips 2, 4, and 9 units long, then have them cut one strip the sum of the three (add to get 12 units). The students then fold the long strip into 3 even pieces and cut into pieces (divide by 3). The average of the three strips is the length of one of the three "even" pieces.

Then have the students calculate the average as illustrated. Elicit from the students the two steps: add the three lengths, divide the sum by 3.

ACTIVITIES

1. Using the short method find the average (the division may involve remainders).

- age of students in a row
- number of students in a row in the class
- temperature over a two- or three-day period

2. Have the students work in groups of 2, 3, 4, and/or 5. They each measure in centimetres the length of his/her shoe. They share the information within the group and calculate the average length of each group's shoe size.

3. Have the students find the average class size in the school. They will need to find the number of children in each class.

EXTRA PRACTICE

Calculate the average of each set of numbers.

- 3, 5, 9, 7
- 32, 38
- 27, 13, 13, 17, 5
- 21, 21, 21
- 19, 38, 6
- 7, 8, 27, 32, 6, 4

OBJECTIVE

To round to the nearest centimetre, decimetre and ten millimetres

PACING

Level A All
Level B All
Level C All

MATERIALS

rulers marked in centimetres and millimetres

BACKGROUND

Rounding to the nearest multiple of 10 and to the nearest multiple of 100 have been dealt with on pages 81 and 92 respectively.

SUGGESTIONS

Initial Activity Not only should students know how to round but they should know when to round. Discuss whether they might round in these cases:

- length of a pace
- length of a handspan
- length of a leaf
- comparing prices of 2 kinds of jams in a store
- cutting a board to fit in making a cabinet.

ACTIVITIES

1. Have students measure various objects in the classroom and round the measure to the nearest centimetre, ten centimetres, etc. When measuring objects, students should note those rounded "up" and those rounded "down". When many objects have been measured, note whether the number of times of averaging up is about the same as the number of times of averaging down.

2. You may wish to have the students play "The Great Disappearing Act" (see Activity 3, page 34) to maintain place-value skills.

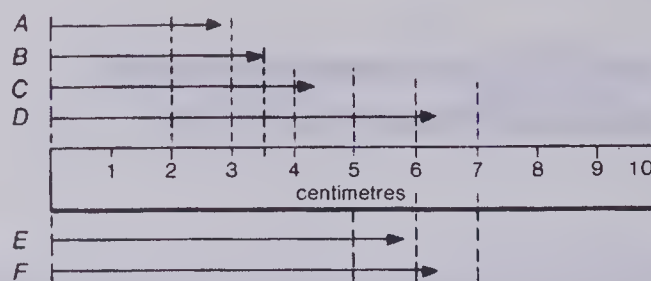
3. If you have not already done so, see the Activities described in Chapter 3, pages 81 and 92.

EXTRA PRACTICE

Which of the measures is it appropriate to round to the nearest number of units indicated?

- your height (centimetre) (yes)
- bearing on a car (centimetre) (no)
- length of school yard (metre) (yes)
- your mass (kilogram) (yes)
- the mass of a chemical in a

Rounding



The length of arrow A is more than 2 cm. It is less than 3 cm.

The arrow is closer to 3 cm than to 2 cm.

Rounded to the nearest centimetre, the arrow is 3 cm long.

Look at arrow B.

When the length is halfway between two units, we round up to the larger unit.

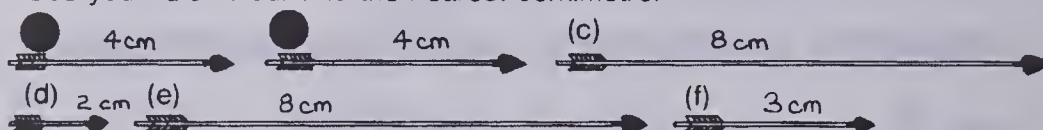
Rounded to the nearest centimetre, arrow B is 4 cm long.

Exercises

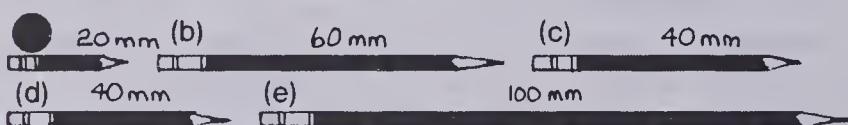
1. Give the length rounded to the nearest centimetre.

- | | | | |
|-----------------------|------|-----------------------|------|
| ● length of arrow C | 4 cm | (b) length of arrow D | 6 cm |
| (c) length of arrow E | 6 cm | (d) length of arrow F | 6 cm |

2. Use your ruler. Round to the nearest centimetre.



3. Round to the nearest 10 mm.



166 Rounding

Using the Book Emphasize the general question that can be used: "Is it closer to ____ or to ____?" Then develop the idea that if it is less than the halfway mark of the unit, use the smaller number; if it is more than halfway, use the larger number. If it is halfway, round up to the larger number.

When rounding to the nearest 10, remind them the middle point is 5, 15, 25, 35, etc. Use a large number line to show that 36 rounded to the nearest 10 is 40, while 34 is rounded to 30. Point out that 1-4 are rounded to 0, while 5-9 are rounded to 10.

medical prescription (kilogram)
(no)

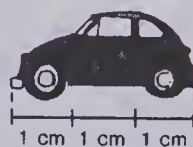
- the mass of an order of meat for Sunday dinner (gram) (yes)
- the amount of water used by a householder in a month (1000 L) (yes)
- the distance between two cities (kilometre) (yes)
- the distance across a city (10 km) (no)
- the distance around the world (1000 km) (yes)

Drawing to Scale

We can draw pictures of real things to scale.

1 cm shows a real distance of 1 m.

This segment shows a real length of 3 m.



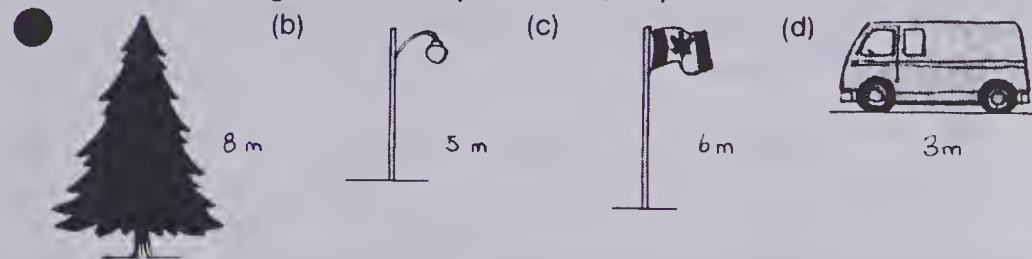
Exercises

1. What is the real length of segment A? B? C?

1 cm shows 1 m.



2. What is the real height of each object? 1 cm represents 2 m.



This time use 1 cm to show one decimetre (1 dm).

What is the real length represented by each? Use your ruler.



Scale drawings 167

OBJECTIVE

To calculate the actual size given the scale and the picture size

PACING

Level A 1-3

Level B 1-3

Level C 2-3

BACKGROUND

The idea of scale drawings is fundamental to many graphical representations, such as maps, drawings of buildings, and pictures of polygons and polyhedra in geometry. Hence, the concept introduction of page 167 should be developed further in the following pages. This work is based on the concept of proportion.

SUGGESTIONS

Initial Activity Discuss the need to draw to scale. We can't draw a picture of a house, a car, or a person full size. Yet, we may want to know the actual size of the object in the picture. By using a scale we can indicate the size without writing it specifically. Discuss situations where scale drawings are used (blueprints, maps, etc.).

Using the Book Discuss the display. Suggest we want to know the actual (real) length of a car when we know the length of the car in the picture is 3 cm, and that 1 cm represents 1 m. Elicit from the students the answer. Then discuss the actual (real) height when the picture height is 1.5 cm.

Do Exercises 1 and 2 as a class activity. Some students will have difficulty when an object is 0.5 cm and 1 cm represents 2 m. Discuss the relationship.

Have students do Exercises 3-5 on their own and then exchange work with a friend to check each other's work.

ACTIVITIES

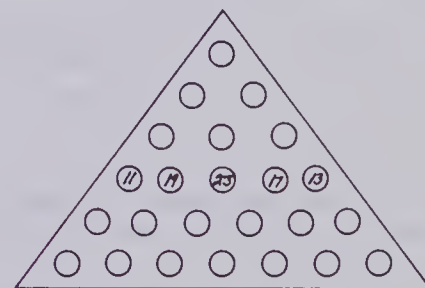
1. Encourage students who have scale models to bring them to school. For those models where the scale is known, have students find the actual size of the real object.

2. Reverse the procedure by asking the student to tell how long the picture of your desk (or chalkboard, door, etc.) would be if 1 m were represented by 1 cm (subsequently 1 m represented by 1 mm, etc.). Ask the students to repeat for many objects in the classroom.

3. Children might enjoy playing "Scale the Mountain". Prepare: (a) blank game sheets as shown (note that

11, 13, 17, 19, and 23 have already been placed and may be used as needed), (b) a "Scale" die showing 1 m, 2 m, 3 m, 1 m, 2 m, 3 m, and (c) "Segment" cards showing 1 cm, 2 cm, ..., 10 cm. Players randomly fill each empty space on their "mountain" with numerals from 1-25. Each number can be used only once. Caller chooses a segment card, identifies it to players (e.g., "4 cm") and returns it to the deck. (Caller rolls "scale die" and gives scale to players (e.g., 1 cm shows 3 m). Players compute and cross off real length (i.e., 1 cm = 3 m \therefore 4 cm = 12 m). First player to have crossed off a

path (i.e., adjacent numbers from bottom to top) has scaled the mountain and becomes the next caller.



EXTRA PRACTICE

Tell the students to pretend that 1 cm shows 3 m. Then ask them to tell the real height of each object in Exercise 2 and the real length of each item in Exercise 3.

Repeat when 1 cm shows 3, 5, 10 m, etc.

OBJECTIVE

To introduce scale for maps:

$$1 \text{ cm} = 1 \text{ km}$$

PACING

Level A All

Level B All

Level C 1, 2, 6-9

VOCABULARY

Grosbeak, Eagle Lookout

RELATED AIDS

HMS—DM46.

SUGGESTIONS

Initial Activity Discuss the need to identify the scale used on a map before reading the map. Scales vary according to need. Using a school atlas or any suitably marked material, find the scale used on three or four different maps and discuss why different scales are used.

ACTIVITIES

1. "The Race"—Prepare two sets of cards. One set has scales on it such as: "1 cm shows 1 km, 1 cm shows 2 km, 1 cm shows 5 km, 1 cm shows 10 km, 1 cm shows 100 km." These can be repeated. The other set has segments of various lengths. The first player draws a card from each deck, both decks being face down on the table. The player measures the segment using a ruler, and using the scale shown on the second card, must tell what real distance the segment represents. Score is kept by adding the distances. The players take turns. The first to make 200 km is the winner of the race.

2. See DM46, "Scale Drawings".

EXTRA PRACTICE

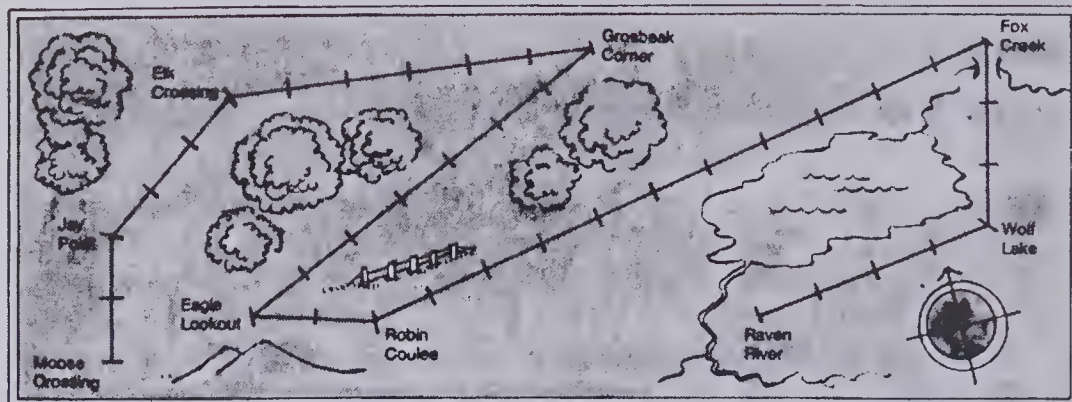
- 1 cm shows 5 km. What is the actual distance shown by a segment that is (a) 2 cm (b) 5 cm (c) 3.5 cm (d) 5.5 cm?
- 1 cm shows 10 km. What is the actual distance shown by a segment that is (a) 2 cm (b) 5 cm (c) 7.5 cm (d) 15.3 cm?
- 1 cm shows 1 km. What is the length of the segment that shows (a) 10 km (b) 4 km (c) 20 km (d) 26 km?
- 1 cm shows 3 km. What is the length of the segment that shows (a) 3 km (b) 6 km (c) 12 km (d) 33 km?

Maps

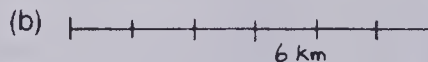
— On the map, this segment shows 1 km.

— This segment shows 3 km.

Map of Trails at Boy Scout Camp



1. What distance is shown?



Write the distance along the trails between each two places.

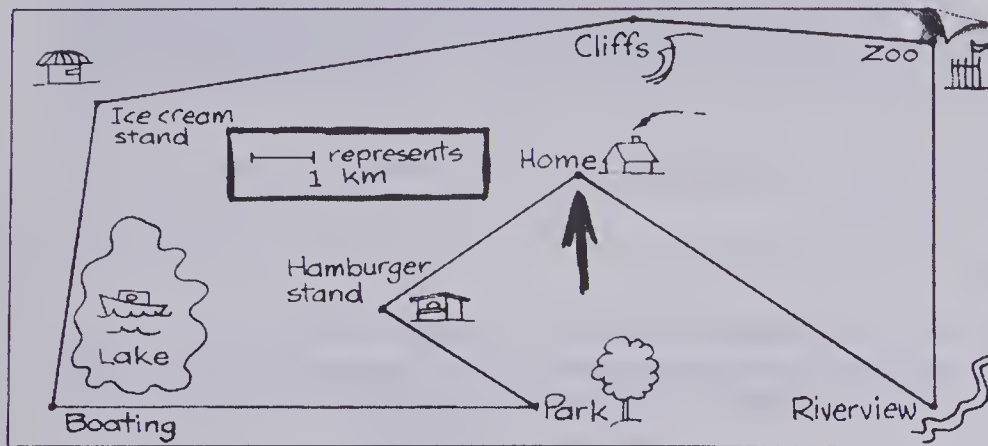
- | | |
|--|---|
| ● Moose Crossing to Jay Point. 2 km | ● Jay Point to Elk Crossing 3 km |
| 4. Elk Crossing to Grosbeak Corner. 6 km | 5. Grosbeak Corner to Eagle Lookout. 7 km |
| 6. Eagle Lookout to Fox Creek. 13 km | 7. Fox Creek to Raven River. 7 km |
| 8. Jay Point to Eagle Lookout. 16 km | 9. Moose Crossing to Raven River 38 km |

168 Scale drawings

Using the Book Examine the map and have students identify the scale used. Make certain students understand that the actual distance from Jay Point to Elk Crossing is 3 km. Ask students what distance 5 cm and 2.5 cm on the map represents.

A Sunday Drive

Jan and her parents went for a Sunday drive.
Jan's Father drew this map.



- Name the places Jan and her parents visited Riverview, zoo, cliffs, ice-cream stand, lake, park, and hamburger stand.
- How far is it from:

● Home to Riverview? 7 km	● Riverview to the Zoo? 6 km
(c) Zoo to the Cliffs? 5 km	(d) Cliffs to the Ice-cream stand? 9 km
(e) Ice-cream stand to the Lake? 5 km	(f) Lake to the Park? 8 km
(g) Park to the Hamburger stand? 3 km	(h) Hamburger stand to Home? 4 km
- Add to find the answers. How far is it on the map from:

● Home to the Zoo? 13 km	(b) Zoo to the Ice-cream stand? 14 km
(c) Ice-cream stand to the Park? 13 km	(d) Park to Home? 7 km
(e) Home to the Ice-cream stand? 27 km	(f) Ice-cream stand to the Hamburger stand? 16 km
- What is the total distance Jan and her parents drove? 47 km

Scale drawings 169

Using the Book Determine the scale used for the map. Ask the students what information the display contains. Ask such questions as: "Where did Jan and her parents go on the Sunday drive? (various)" "Does the map tell which way they went? (no)" "Is the hamburger stand nearer the park or the zoo? (park)" "How far (use your rulers) is it from the zoo to the cliffs on the map? in kilometres? (5 cm ∴ 5 km)"

OBJECTIVES

- To provide exercise in measuring in centimetres
- To use a scale to determine distance on map

PACING

- Level A 1-3
- Level B 1-3
- Level C 2-4

VOCABULARY

represents

MATERIALS

centimetre rulers

SUGGESTIONS

Initial Activity Review the centimetre scale and use of the centimetre ruler. Discuss the need for accurate readings when using the ruler. (A small error on a scale drawing results in a large actual error.)

ACTIVITIES

1. Prepare simple maps of your community (roughly drawn) using some scale such as 1 cm represents 2 km. The students, using rulers, are to: (a) find the actual distance between given points on the map; (b) by calculation find the distance in real life. Repeat for maps of a city.

2. Have students find the actual measure of the gymnasium, the school yard, their favourite room, etc. and then draw a map to scale to represent the area chosen.

3. Use a school atlas to determine the distance in kilometres of various towns, cities, etc., in proximity to the student's area of residence.

OBJECTIVE

To develop perception of long distances in kilometres

PACING

Level A All
Level B All
Level C All

MATERIALS

100 m cord or trundle wheel

BACKGROUND

Ten lengths of 100 m is equivalent to 1 km ($1000\text{ m} = 1\text{ km}$). This approach to a kilometre can help students get used to how long a kilometre is. (See also notes for page 51.)

SUGGESTIONS

Initial Activity You may prefer to do the activity in the display before starting this page. Then the lesson can proceed uninterrupted. Because of the length of one kilometre, work in groups. The activity should be done at least once to familiarize students with the actual distance of a kilometre. A trundle wheel can be used in place of a 100 m cord.

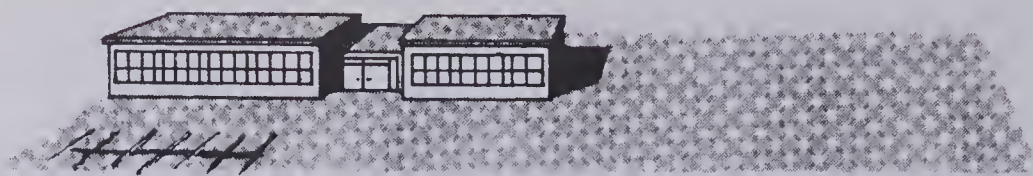
ACTIVITIES

1. You may wish to set up a running program for part of the physical education class. Measure various distances in the school yard (1 km, 2 km, etc.). Students can keep a record of the distances run and the time it took each day.

2. A class running activity can be organized by recording the distance run each day by members of the class. Is it possible to run across Canada? to the closest major city?, etc.

3. Refer to Activity 2 above. Challenge other classes to see which class can "run across Canada" first.

Walking to School



Use a 100 m cord.

Measure a route in your playground that is 10 of these cords long.

Mark with stakes.

Exercises

1. ● What is the distance in metres of this route? 1000 m
(b) How many minutes are needed for you to walk the route?
(c) Copy and complete. I can walk 1 km in ■ min.
I can walk 2 km in ■ min.
2. Mary walked 1 km in 10 min.
How far can Mary walk in 20 min? 2 km
3. Mary walked from her house to school.
Time: 30 min.
How far is it from her house to school? 3 km
4. John walked 1 km in 8 min.
John walked from home to school.
Time: 24 min.
How far is it from home to school? 3 km
5. How long does it take you to walk to school?
How far is it from your house to school?

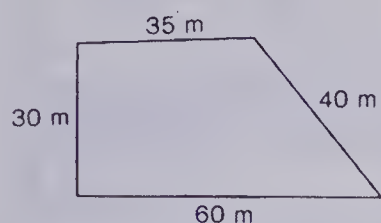
170 Activity

Using the Book Develop the concept of proportion intuitively. You may want to use something students are quite familiar with: 1 chocolate bar costs 30¢, 2 chocolate bars cost ? ¢, 1 candy costs 10¢, 5 candies cost ? ¢; etc.

Exercise 5 can only be done by those students who know how long it takes them to walk to school. Using this time and the rate at which the student walks 1 km, the distance can be calculated.

Getting Around

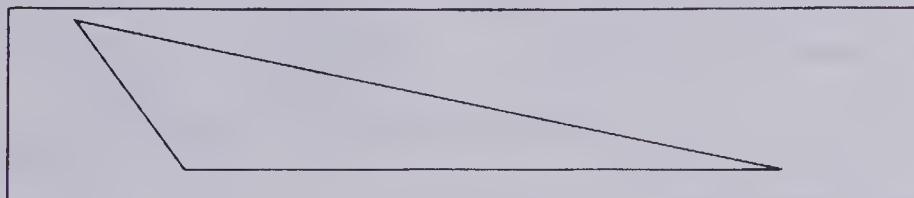
The **perimeter** of a shape is the distance around it.
John walked around the block. How far did he walk?



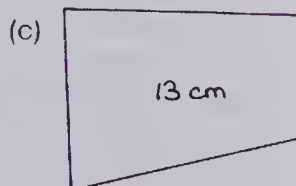
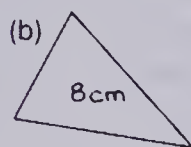
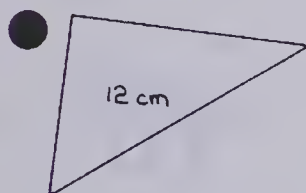
$$\begin{aligned}\text{Perimeter} &= 30 \text{ m} + 60 \text{ m} + 40 \text{ m} + 35 \text{ m} \\ &= 165 \text{ m}\end{aligned}$$

Exercises

- Use your ruler. Find the perimeter in centimetres of:
 (a) the rectangle 36 cm (b) the triangle 25 cm



- Find the perimeter in centimetres.



- Find the perimeter in metres of:
 (a) your classroom (b) your chalkboard
 (c) a door (d) the top of your teacher's desk.

Perimeter 171

Using the Book Hold up a large corrugated cardboard polygon (not regular) and ask the students how they would find the distance around the edges of the shape. Explain you want to put a trim on the polygon so you want to know how much trim you'll need. At their urging, measure each edge, writing the lengths on the chalkboard. Then ask which operation you should use with all the numbers (addition).

Emphasize that perimeter is spelled with an ER not RE as in metre. "Peri-" means around; "metre" means the measure, hence "perimeter" means "the measure around" the object.

OBJECTIVES

To develop the concept of perimeter
To calculate the perimeter of a polygon

PACING

Level A All
Level B All
Level C All

VOCABULARY

perimeter

MATERIALS

a large corrugated cardboard polygon

RELATED AIDS

CALC. W/BK — 12.

BACKGROUND

The perimeter of any simple closed curve is the length of that curve. The perimeter of a polygon is the sum of the measure of its sides. In student terms, it is the distance around the polygon.

SUGGESTIONS

Initial Activity Hold the corrugated cardboard polygon and have a student wrap a string around it (along its edges). Cut to length. Then measure the string. When doing this, talk about the distance "around" the shape. Then introduce the word "perimeter" by saying another way of talking about the distance around a shape is to use the word "perimeter" as in "The perimeter of the shape is ____ cm."

ACTIVITIES

- Provide a set of cardboard polygons with sides suitable for measuring by your students. Each student is to measure its sides and calculate the perimeter.
- Identify shapes in the classroom which your students are to measure in order to find the perimeter. Suitable items are desk top, room floor, chalkboard, etc.
- Provide a set of regular polygons (all sides of a shape are the same length). Challenge the students to find a short way of finding the perimeters of each regular shape.

OBJECTIVE

To identify what information is missing in a problem

PACING

Level A 1-5

Level B All

Level C All

VOCABULARY

information

SUGGESTIONS

Initial Activity Pose a problem like this:

Mary has some brown and some white kittens.

How many kittens has she altogether?
"Can you solve the problem? (no)"

"Why can't you solve the problem? (not enough information) What information do you need to solve the problem? (how many brown and how many white kittens Mary has)" Repeat with other similar problems.

ACTIVITIES

1. Play the game "Who Has?" from the Activity Reservoir.

2. Ask certain students to provide the missing information for each question on this page in the text. Stress that the information provided must be appropriate to the situation. Then have the class solve the questions.

3. Have the class start a scrapbook of puzzles and challenging problems collected from newspapers, magazines, and library books. The answers to each question should be written in upside down so that the reader cannot readily see the answers. Students may exchange items.

EXTRA PRACTICE

Ask what information is missing. Then ask specific students to provide the additional information. (Encourage the use of appropriate information.) The balance of the students then solve the problems. Emphasize only sufficient information be given.

1. Three trees are in the park.

How much taller is the tallest than the shortest?

2. Ted bought four fish at the market.

How much more did the most expensive one cost than the least expensive?

3. Nina cut three lengths of rope.

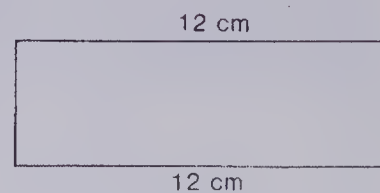
How long are the three pieces of rope altogether?

What's Missing?

What information is missing in each question?

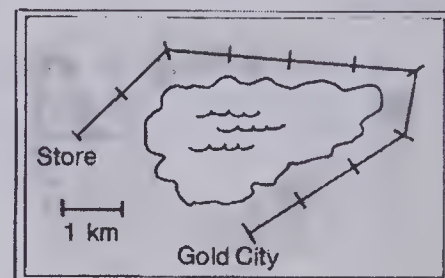
- Jill walked 2 km.
How much farther has she to go?
The total distance Jill must walk

- What is the perimeter of this rectangle?
The width of the rectangle.



- Jennifer bought
1 milkshake for 65¢
1 hamburger for 95¢.
How much change did she get?
The amount Jennifer paid.

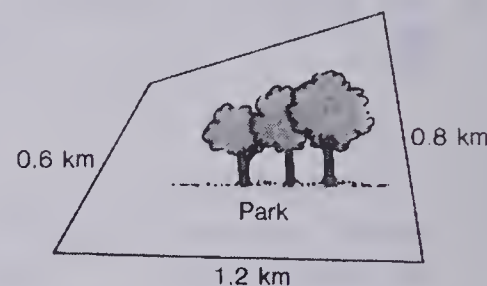
4. The map shows the Brownies' camp.
How far from Bay Lookout to the store?
Bay Lookout is not shown on the map.



5. Harry went for a boat ride.
The cost was \$1.25.
What coins did he get in change?
The amount Harry paid.

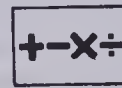
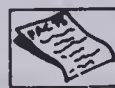
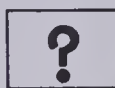
6. Millie and Billie rented a canoe.
They got \$1.25 in change.
What did the canoe cost?
The amount they paid

7. Nettie rode her bicycle around the park.
How far did she go? The distance of one side of the park.



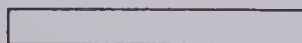
172 Missing information in problems

Using the Book Review Professor Q's four questions used in doing problems.

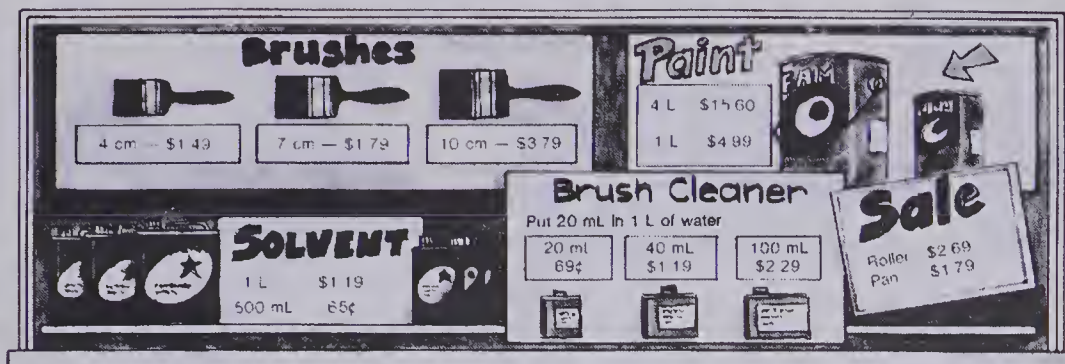


Ask the students which of the Professor's questions could not be answered adequately if there is too little information (3 and 4). Explain that in this set of questions there is too little information given. The students are to tell what additional information is needed to solve each problem.

4. What is the perimeter of the rectangle?



The Paint Store



Refer to the paint store window.

- The Greens plan to paint their kitchen.
2 L of paint cover 1 wall.
There are 4 walls the same size.
How much paint is necessary to paint the walls? 8 L
- Total paint needed for walls: yellow — 6 L, white — 2 L.
Total cost? \$35.56
- Paint needed for ceiling: 3 L — eggshell white.
(a) How much would three 1 L cans cost? \$14.97
(b) How much would one 4 L can cost? \$15.60
★(c) Which should the Greens buy? Why? Answers will vary.
- The Greens need 1 L and 500 mL of paint solvent.
Cost? \$1.84
- The Greens decided to buy brush cleaner.
How many litres of brush cleaner would each make?
(a) 20 mL 1 L (b) 40 mL 2 L (c) 100 mL 5 L

Problem solving — capacity 173

Using the Book Elicit from the students the information contained in the display. Many different skills are involved in this page. Assistance may be necessary for the weaker math students.

Exercise 3(c) should be discussed with the class. The difference in price between three 1 L cans and one 4 L can is 63¢. Ask what would happen if the estimate of 3 L was incorrect and 3 L was not enough. Point out that it is sometimes hard to get exactly the same color in a second mix. Therefore for 63¢ extra it might be best to get the 4 L can to be certain to have enough. It may depend on how certain the Greens are that 3 L will be enough.

OBJECTIVE

To apply concepts of measurement (capacity) to word problems

PACING

Level A 1-3(b), 4
Level B All
Level C All

VOCABULARY

paint solvent, eggshell white

SUGGESTIONS

Initial Activity Discuss with the class what is needed to redecorate a room. Ask what mathematics skills are necessary to do this type of work (careful measurement, addition of money, etc.).

ACTIVITIES

1. Have students choose a room at home or have them design a dream room. The students plan the cost to redecorate the room. Room measurements will have to be found or given. Students can use a catalogue to find the cost of paint, etc.

2. Choose an advertisement from a local store. Have the students make up one question each, based on the advertisement. Answers are to be on the back of the page. Students exchange questions.

3. Plan an outdoor mathematics activity. Locate a building that is in need of painting. Have students determine the cost of painting the outside of the building. (Make arrangements ahead of time for students to measure the building — get permission from the owner!)

EXTRA PRACTICE

(See text page for price.)

- ★ 1. The Greens estimate they will need 3 L of brush cleaner.
What cans of brush cleaner should they buy?
- ★ 2. Which cost more and by how much?
(a) seven 1 L cans of paint or two 4 L cans of paint
(b) four 1 L cans of solvent or seven 500 mL cans of solvent

OBJECTIVE

To develop the concept of litre and millilitre

PACING

Level A All
Level B All
Level C All

MATERIALS

litre and millilitre containers

BACKGROUND

The exercises use the student's intuition of ratio or repeated addition and not multiplication.

$$1 \text{ L} = 1000 \text{ mL}$$

$$0.5 \text{ L} = \blacksquare$$

The student should realize the answer is one half of 1000.

SUGGESTIONS

Initial Activity Have the students fill several containers comparing the capacity of each container with every other container. Be sure one container holds 1 L and one container is marked in millilitres. Compare capacity using water, bird seed, puffed wheat, etc. Develop the relationship, $1 \text{ L} = 1000 \text{ mL}$.

Review these by leaving the blanks empty:

$$\frac{2}{10} \times 5 = 10$$

$$\frac{10}{10} \times 10 = 100$$

$$\frac{10}{10} \times 100 = 1000$$

$$\frac{4}{10} \times 250 = 1000$$

Have students complete these patterns.

(a) one litre = 1000 mL
two litres = ____ mL
three litres = ____ mL
⋮

ten litres = ____ mL

(b) one litre = 1000 mL
one half litre = ____ mL
one quarter litre = ____ mL
one tenth litre = ____ mL


ACTIVITIES

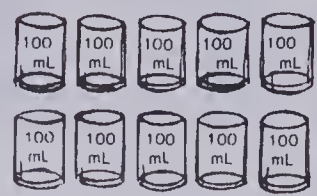
1. Use a 1 mL measuring spoon to find the capacity of several small containers that will hold water (thimble, tablespoon, Centicube*, medicine vial, etc.) to familiarize students with the millilitre. Repeat with a 10 mL container. If using a 10 mL container to fill a litre container, this will take a long time. It may be possible to fill a decilitre container using the 10 mL container and then use the decilitre container to fill the litre.

2. Make a worktable display of cans, jars, etc. that have the capacity in millilitres (litres) marked on them.

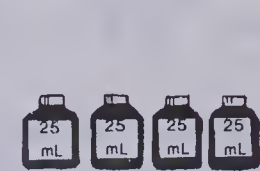
Litres and Millilitres

one litre = one thousand millilitres





1 L = 1000 mL



Medicine

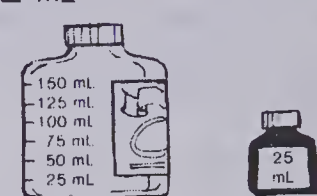
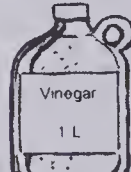

Exercises

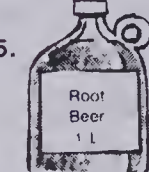

- Use five different containers. Estimate the capacity of each: the larger ones in litres, the smaller ones in millilitres.



Complete.



1 L = $\frac{1000}{\blacksquare}$ mL 2 L = $\frac{2000}{\blacksquare}$ mL

A large bottle of medicine holds 150 mL. A small bottle holds 25 mL. How many small bottles will be needed to fill a large bottle? 6


- 


How many glasses? 10
- 


How many mugs? 4
- 


How many spoonfuls? 2
- 


How many spoonfuls? 10

174 Millilitres

Using the Book Exercise 1 should be done several times a year in order for the students to develop an ability to estimate capacity.

Besides having the necessary containers on hand, be sure that the children know how to respond in their workbooks, answer sheets, etc.

3. Make a bulletin board display of labels from cans, jars, etc. that have the capacity in millilitres or litres marked on them.

EXTRA PRACTICE

1. Sue wants to buy 1 L of ice cream. She can get a 1 L carton for \$1.35 or two 500 mL cartons at 75¢ each. Which is the better buy?

2. A 1 L bottle of root beer costs \$1.56. A 2 L bottle costs \$3.25. Mark needs 4 L of root beer. What should he buy?

3. Copy and complete.

$$1 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$$

$$3 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$$

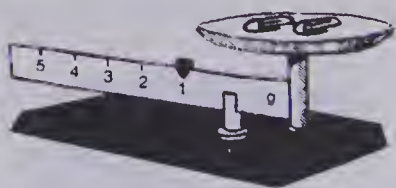
$$4 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$$

$$0.5 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$$

$$1.5 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$$

*By permission of E.S. Perry Limited, Osmiroid Works, Gosport, England.

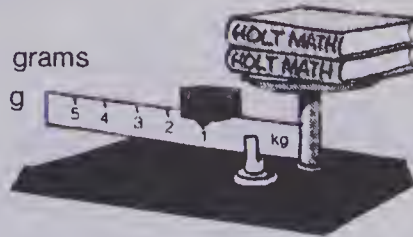
Mass



1 g = mass of 2 paper clips

1 kilogram = 1000 grams

1 kg = 1000 g



1 kg = mass of 2 of these books

Exercises

Copy and complete.

- | | |
|--|--|
| 1. 2 paper clips = <input type="text"/> g 1 | 2. 2 books = <input type="text"/> kg 1 |
| 4 paper clips = <input type="text"/> g 2 | 4 books = <input type="text"/> kg 2 |
| 10 paper clips = <input type="text"/> g 5 | 6 books = <input type="text"/> kg 3 |
| 20 paper clips = <input type="text"/> g 10 | 10 books = <input type="text"/> kg 5 |
| 200 paper clips = <input type="text"/> g 100 | 20 books = <input type="text"/> kg 10 |
| 3. 1 pumpkin = 2 kg | 4. 1 sled = 3 kg |
| 2 pumpkins = <input type="text"/> kg 4 | 2 sleds = <input type="text"/> kg 6 |
| 3 pumpkins = <input type="text"/> kg 6 | 5 sleds = <input type="text"/> kg 15 |
| 10 pumpkins = <input type="text"/> kg 20 | 10 sleds = <input type="text"/> kg 30 |
| 20 pumpkins = <input type="text"/> kg 40 | 20 sleds = <input type="text"/> kg 60 |
| 5. 1 kg = <input type="text"/> g 1000 | 6. 1000 g = 1 kg |
| 2 kg = <input type="text"/> g 2000 | 2000 g = <input type="text"/> kg 2 |
| 3 kg = <input type="text"/> g 3000 | 3000 g = <input type="text"/> kg 3 |
| 5 kg = <input type="text"/> g 5000 | ★ 500 g = <input type="text"/> kg 0.5 |
| ★ 0.5 kg = <input type="text"/> g 500 | ★ 1500 g = <input type="text"/> kg 1.5 |
| 7. What is your mass? | 8. What is the mass of your shoe? |

Mass 175

Using the Book Introduce the exercises by having the students orally do problems of the type:

1 chocolate bar is 25¢.

2 chocolate bars are ____¢.

5 chocolate bars are ____¢.

1 apple is 15¢.

2 apples are ____¢.

10 apples are ____¢.

OBJECTIVE

To review grams and kilograms

PACING

- Level A First 4 of each of Exercises 1-5, first of Exercise 6, 7, and 8
 Level B All except starred questions
 Level C All

MATERIALS

scales (balance, bathroom, etc.), small stones, pencils, crayons, etc.

SUGGESTIONS

Initial Activity Utilize and develop the concept of ratio. This should be developed intuitively. Have the students bring several small objects from home and find their mass using a scale. Have them find the mass of 1 object, then 2 of the same object, then 5 of the same object, etc.

ACTIVITIES

1. Supply zip plastic bags that have been filled with 10 g, 100 g, 250 g, 500 g, 750 g, 1000 g, 2000 g of gravel. Students are to match labels with the masses used written on them with the appropriate bag of gravel. They then check using a scale.

2. Have the students find three objects in the classroom the mass of which is most conveniently measured in grams. Repeat in kilograms. Students should estimate the mass of the object before measuring to find the true mass.

OBJECTIVE

To review units of measure for consumer goods

PACING

Level A All

Level B All

Level C All

MATERIALS

newspaper, pictures of consumer goods

SUGGESTIONS

Initial Activity Review the commonly used units of measure for linear measure (centimetre, metre, kilometre), mass measure (gram, kilogram), and capacity measure (millilitre, litre). Discuss the appropriate use of each. Have the students prepare a bulletin-board display with pictures of things they would buy in the various units.

ACTIVITIES

1. Discuss consumer protection and comparison shopping. Provide ads from newspapers. Have students find 10 items (same size) from two different store ads. They are to find the cost of the 10 items from each store and decide which store is the most "economical".

2. Explain unit cost. Allow students to use calculators to find unit costs of 5 different items from 2 different stores. Ask: "Which store would you shop at?"

3. Have the students play "Concentration", as described in the Activity Reservoir. On one set of cards place pictures of objects. On the other set of cards place measurements to match the objects on the first set of cards.

EXTRA PRACTICE

What unit is used to measure each item?

1. bag of potatoes (kg)
2. small bottle of pop (mL)
3. large bottle of pop (L)
4. length of car race (km)
5. length of ribbon (m)
6. length of recess (min)

Shopping

What unit do you think is used to measure each item?

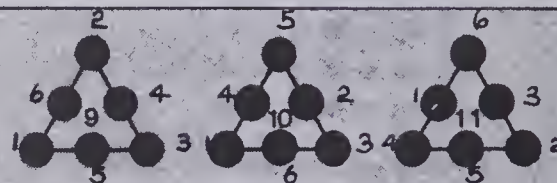
 Butter kilogram	 Gasoline litre	 Cloth metre
4.  Cough syrup millilitre	5.  Toothpaste millilitre	6.  Tomatoes kilogram
7.  Paper centimetre	8.  Board millimetre	9.  Steak kilogram

Name 3 things you would find in a store measured in:

- | | | |
|-----------------|-----------------|------------|
| 10. kilograms | 11. metres | 12. litres |
| 13. millilitres | 14. centimetres | 15. grams |

BRAINTICKLER

Use the numbers 1, 2, 3, 4, 5, and 6 so that each side of the triangles has the total indicated.



176 Units of measure for consumer goods

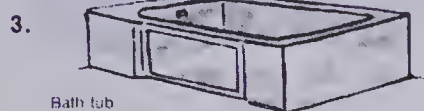
Using the Book Do Exercises 1-9 orally. Discuss why the correct units are appropriate. Students may need to use newspaper advertisements to answer Exercises 10-15.

Estimating

Estimate the measure as indicated in each. Answers will vary.



Gas tank of small car?



Bath tub

Capacity?



Mass of new baby?



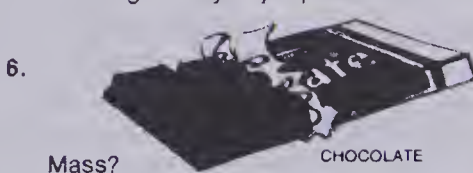
Time to walk around your school?



Length of block?



How high can you jump?



Mass?



Length of your middle finger?

Copy and complete.

● The circular road around town is about 30 ^{km} long.

● The capacity of a pop bottle is about 300 ^{mL}.

11. The softball bat is about 90 ^{cm} long.

12. The truck can carry a load of about 2000 ^{kg}.

OBJECTIVE

To develop the ability to estimate capacity, length, mass, and time

PACING

Level A All

Level B All

Level C All

VOCABULARY

circular

MATERIALS

measuring instruments such as tape measures, rulers, scales, litre container, clock

RELATED AIDS

HMS—DM47.

BACKGROUND

In order to estimate the size (length, mass, capacity) of an item, one needs to have a referent; that is, one needs to be able to recall some relative object or distance of which they know the measure. Hence, to estimate the number of litres in the tank of a small car, it helps to know the capacity of the tank of any car. It is therefore important that students repeat certain experiences until these referents are firmly fixed. If you have not already done so, see teacher notes and activities for pages 47-52.

SUGGESTIONS

Initial Activity Discuss the length, time, mass and/or capacity of various familiar objects or events for which the approximate measurements are known (i.e., height of door, length of time to walk a kilometre, mass of textbook, capacity of cup, mug, etc.).

ACTIVITIES

1. See DM47 for "Estimate and Measure" activities.

2. Fill several boxes of the same size with different kinds of materials such as gravel, puffed rice, sand, sawdust, etc. Have students lift the boxes and approximate the mass. Check guesses by actual measurement.

3. Make flash cards with pictures of different objects on each card. Divide the students into teams. The leader flashes a card. The first student to identify the unit of measure for the

object scores one point for the team.

EXTRA PRACTICE

Prepare on the chalkboard with the help of the students, lists of objects and the approximate measures. Use the headings: Short Lengths (mm, cm); Long Lengths (m, km), Small Capacities (mL); Large Capacities (L); Light (g); Heavy (kg). These will act as referents for estimating.

Example

Short Lengths

finger—10 cm

dime thickness—1 mm

OBJECTIVE

To solve problems using information in paragraph form

PACING

Level A All
Level B All
Level C All

VOCABULARY

concrete, tunnels, platforms, stretched

RELATED AIDS

HMS—DM48.

BACKGROUND

It is important to use the auditory and visual modes. Children better understand the reading-thinking process required of them when they are able to hear as well as see the message.

SUGGESTIONS

Initial Activity Ask the students to listen carefully while you read the story to them. Set the purpose for listening: identify your favourite object in the playground.

ACTIVITIES

Ask the students to draw a picture of the playground, or part of it, as described in the text.

EXTRA PRACTICE

1. Assign DM48.

2. Maintain computational skills.

Add.	341	7543	789 875
	23	28	6 456
	<u>+ 451</u>	351	39
		<u>+ 4102</u>	<u>+ 40 088</u>

Subtract.

536	6008	78 945
<u>- 197</u>	<u>- 899</u>	<u>- 3 046</u>

Multiply.

75	674	308
<u>× 6</u>	<u>× 4</u>	<u>× 9</u>

Divide.

7 $\overline{)238}$	5 $\overline{)235}$	8 $\overline{)448}$
---------------------	---------------------	---------------------

Playground



Debbie and Paul explored the new playground at the city park. There were three groups of new swings. Debbie counted five swings in each group. Then the children ran through two concrete tunnels. A friend said the tunnels were very heavy — about 850 kg each!

At the north end of the playground, Paul climbed over a dozen tree trunk platforms. The shortest one was eighteen centimetres high. The tallest was the same height as a metrestick.

Later, Debbie and Paul raced to the large, red slide. Fourteen children stood in line waiting for their turn. Eighteen other children were riding log horses hung from ropes. Each horse had three seats. Paul and Debbie and four friends waited their turn for a ride.

Then they discovered the rope bridge. Four heavy ropes about 6 m long were stretched between two platforms. Each platform was made like a fort. A ladder with ten rungs led up to each fort. From the two large windows in one of the forts, Paul and Debbie could see the four sets of monkey bars. Five children were climbing on one of the sets; eight children were climbing on each of the other sets.

Find answers for each.

1. the total length of the ropes on the rope bridge 24 m
2. the number of new swings 15
3. the difference in heights of the tallest and shortest tree trunks 82 cm
4. the total mass of the concrete tunnels 1700 kg
5. How many more swings than tree trunk platforms are there? 3
6. How many children climbed on the monkey bars? 29

178 Solving problems from a paragraph

Using the Book Direct students to the written text. Ask them to now read the text silently. Set the purpose for silent reading: note the details given about the playground equipment. Clarify any vocabulary problems on an individual basis.

Assign the exercises.

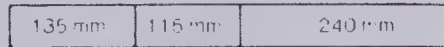
Drawing Pictures For Problems

We can draw a picture to help us solve a problem.

A carpenter had 3 boards.
They were 135 mm, 115 mm,
and 240 mm long.

How long are the boards altogether?

Draw a picture.



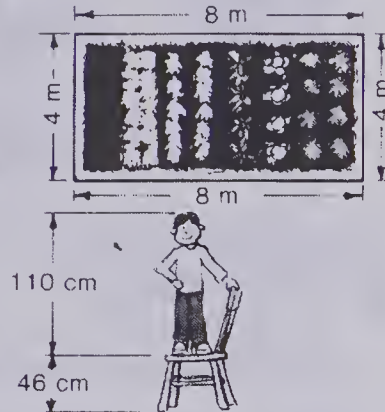
$$\text{Add: } 135 + 115 + 240 = 490.$$

The boards are 490 mm long altogether.

Exercises

Solve these problems. Use the pictures to help you.

1. Mr. Ward put a fence around his garden.
It was 8 m long and 4 m wide.
How much fence did he use? 24 m



2. Bill is 110 cm tall.
He stood on a chair.
The chair is 46 cm tall.
How high is Bill's head? 156 cm

Solve these problems. Draw a picture to help you.

3. Sally had 4 ribbons.
They were 17 cm, 24 cm, 36 cm,
and 52 cm long.
How much ribbon altogether? 129 cm
4. Tanya biked 4 km on Monday,
5 km on Tuesday, 6 km on
Wednesday, and 2 km on Thursday.
How far did she travel? 17 km

OBJECTIVE

To draw pictures to solve problems

PACING

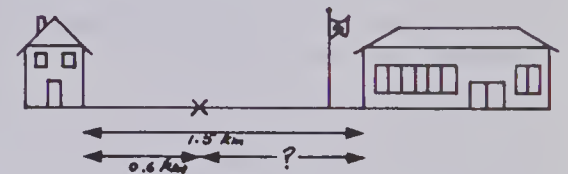
Level A All
Level B All
Level C All

RELATED AIDS

HMS—DM49.

SUGGESTIONS

Initial Activity On the chalkboard, present a short problem such as: "Sara lives 1.5 km from school. She walks 0.6 km and stops to meet her friend. How much farther does she have to walk?" Demonstrate for the children that making a simple sketch such as:



helps simplify, clarify solution:
 $1.5 - 0.6 = 0.9$.

Using the Book Read through the display at the top of the page with the children. Be sure they realize that the three connected rectangles represent the 3 boards in question. You may wish to complete Exercise 1 orally, the answer for which is in the back of the book.

ACTIVITIES

1. Ask each student to draw a picture with enough information on it for a math problem. Students then exchange pictures and each student writes a word problem for the picture. The word problem is then passed on to a third student who is to draw a picture and solve the problem. Compare the second picture with the first picture. Post both pictures and the word problem on the bulletin board. Students can use these

problems whenever time permits.
2. Use DM49.

EXTRA PRACTICE

Draw pictures and solve each.

1. One snowman is 153 cm tall.
Another snowman is 98 cm tall.
How much taller is one than the other? (55 cm)
2. A ribbon is folded into 4 equal parts.
It is 196 cm long altogether.
How long is each part? (49 cm)

- ★ 3. Gail has 3 rocks.
She put 1 on one side of a balance scale and 2 on the other side.
They balanced.
Together they have a mass of 10 kg.
What is the mass of the heavier rock? (5 kg)
- ★ 4. A rope 16 m long is divided into 3 parts.
The one piece is equal to the sum of the other two parts.
What is the length of the longest part? (8 m)

OBJECTIVE

To solve two-step problems

PACING

Level A 1-3, 5, 7, 8

Level B 1-8

Level C 3-8

VOCABULARY

speedometer, reflectors, aerial, handlebars

RELATED AIDS

BFA PROB. SOLVING LAB II — 107-109, 112, 188.

SUGGESTIONS

Initial Activity It would be appropriate to begin this lesson with a class discussion. You might point out to students that real-life problems often contain two or more "parts". Encourage students to relate stories of purchases they have made recently. Translate these into numerical problems on the chalkboard, e.g., "Bob received \$10.00 for his birthday. He bought a book for \$2.49 and a record for \$4.75. How much money did he have left?" Work through the steps as outlined in Exercise 1 on page 180.

ACTIVITIES

1. Bring to class catalogues listing bicycles and parts similar to those in the display on page 180. Ask the students to do the questions on pages 180 and 181 using the prices in the catalogues. You may have to alter the questions to match the catalogue.

2. Provide the students with more two-step problems by posing questions similar to this: "You have \$50.00. You may buy two articles from the catalogues. How much money will you have left after buying your two favourite articles?"

3. You may wish to ask the students to do the exercises by rounding the prices and amounts to the nearest dollar for Exercises 1, 3, 5, 7, and 8, and to the nearest 10 dollars for Exercises 2, 4, and 6. The students then use these dollar figures to approximate the answers.

Bicycle Shop

Item	Price
Adult Bicycle	\$149.50
Teen Bicycle	\$109.99
Junior Bicycle	\$87.49
Aerial	\$5.95
Speedometer	\$27.55
Light	\$12.39
Horn	\$4.89
Wheel reflectors (set of four)	\$1.89
Carrier	\$13.75
Gearshift	\$19.59
Banana seat	\$15.79
Racing handlebars	\$16.88
Handle grips (pair)	\$2.95
Tire	\$5.75
Tube	\$3.89
Mud flaps (pair)	\$7.73

Read the problem. Make each number sentence true.

● John had \$10.00.
He bought a set of wheel reflectors and handle grips.
How much money will he have left?

Step 1. Find answers to Professor Q's four questions.
Step 2. $\$1.89 + \$2.95 = \blacksquare \$4.84$ (Add cost of reflectors and hand grips.)
Step 3. $\$10.00 - \$4.84 = \blacksquare \$5.16$ (Subtract to find change.)
John will have $\blacksquare \$5.16$ left.

180 Two-step problems

Using the Book Permit students to become familiar with the objects in the display by asking "What is the cost of the junior bicycle? (\$87.49)" "There is an item that sells for \$16.88. What is it? (racing handlebars)"

The display and exercises on pages 180 and 181 provide students with the formal sequence of steps. The operation and the articles purchased are written within brackets after each open number sentence to demonstrate to students the organization that has taken place. (It is not intended that students should write these out in Exercises 3-8. However, students should be able to describe orally to you what each number sentence represents.)

Encourage students to "read" their solution back into the original problem, e.g., Exercise 3: "Sandy earned \$8.35 altogether. She needs to earn \$8.53 more."

This approach, when coupled with rounding and estimation skills, helps to determine whether an answer is reasonable, e.g., "Sandy earned about \$8.00. The handle bars cost about \$17.00. She needs about \$9.00 more. My answer of \$8.53 is reasonable."

Students should not be encouraged to believe that this process will indicate whether their solution is numerically correct or "right". It does indicate, however, that if a solution is not reasonable, there is good reason to double-check the calculations.

Mr. Finley wants to buy an adult bike and a teen bike.

He has saved \$215.00.

How much more money does he need?

Step 1. Find answers to Professor Q's four questions.

Step 2. $\$149.50 + \$109.99 = \blacksquare \$259.49$ (Add cost of bikes.)

Step 3. $\$259.49 - \$215.00 = \blacksquare \$44.49$ (Subtract to find how much more money is needed.)

Solve these problems. Use the three steps to help you.

3. Sandy earned \$3.75 for baby-sitting.

Then she earned \$4.60 more. Total earned - \$ 8.35

How much more does she need to earn before she can buy racing handlebars for her bike? \$ 8.53

4. Murray received \$15.00 from his Grandmother.

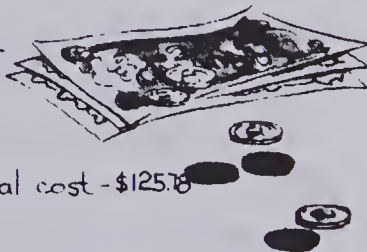
He also received \$18.00 from his Uncle. Total received - \$33.00

How much more money does he need to buy the junior bike? \$54.49

5. Brenda bought a carrier and a light for her bike.

She had saved \$50.00. Total cost - \$26.14

How much money will she have left? \$23.86



6. Kathleen has saved \$140.00.

She bought a teen bike and a banana seat. Total cost - \$125.78

How much money will she have left? \$14.22

7. Michael wanted to buy a speedometer and racing handlebars.

He has saved \$31.45 from his paper route money. Total cost - \$44.43

How much more money does he need? \$12.98

8. Patrick bought a gearshift and a tire. Total cost - \$25.34

How much change will he receive from \$30.00? \$4.66

EXTRA PRACTICE

1. Gordon has \$52.10 in the bank and \$16.50 in his wallet.

He wants to buy a set of racing handlebars, aerial, speedometer, and gearshift.

Does he have enough money?

2. Susan bought 2 tubes, 2 tires, mud flaps, and handle grips.

She paid with a \$10 bill and a \$20 bill.

How much change should she get?

OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

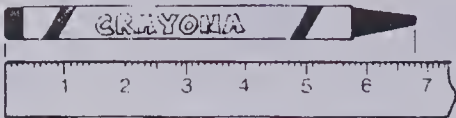
- Level A All
- Level B All
- Level C All

RELATED AIDS


HMS—DM50.


Chapter Test

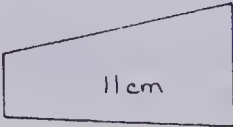
1. Write the size to the nearest centimetre.

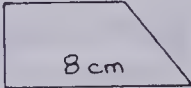

2. Draw a picture. Solve

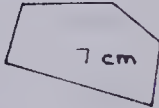
A spruce tree is 6.4 m tall.
An apple tree is 3.9 m tall.
How much taller is the spruce tree? 2.5 m
3. Measure to the nearest 10 mm

(a)  40 mm

(b)  70 mm
4. Use your ruler. Find the perimeter to the nearest centimetre

(a)  11 cm

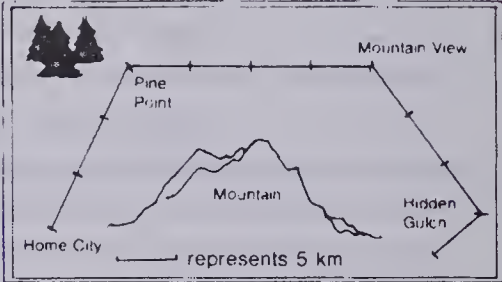
(b)  8 cm

(c)  7 cm
5. Find the average.

6 marbles
Sandy — 7 marbles, Suzanne — 5 marbles, Clare — 6 marbles
6. How far from Pine Point to Mountain View?

20 km
7. A kilogram of butter costs \$2.35.
Karen pays with a \$5 bill for 2 kg.
How much change should Karen get?

\$ 0.30
8. Ribbon costs 31¢ for 1 m.
What is the cost of 4 m of ribbon?

\$ 1.24
9. Is a kilometre farther than the distance around your playground?
- 

Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a number of students had difficulty with a particular topic or concept.

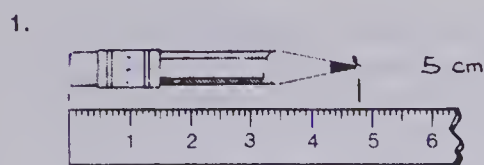
The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 160).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters, available for use with this grade level.

Test Item	Objective	Text Page Number
1, 3	A	166
4	B	171
5	C	164-165
6	D	168-169
2, 7, 8	E	various
9	F	170

Cumulative Review

Write the size to the nearest centimetre



3. (a) The height from the floor to your shoulder when you are standing.
(b) The height from the floor to your waist (belt) when you are standing.

4. What does each mean?

(a) centi one hundredth (b) kilo one thousand (c) deci one tenth

5. Write as a decimal.

(a) three and two tenths 3.2

(b) nine tenths 0.9

6. Write as a decimal.

(a) $1\frac{3}{10}$ 1.3 (b) $\frac{9}{10}$ 0.9

7. Find the perimeter in centimetres.



8. Add.

$$\begin{array}{r} \text{(a)} \quad 1.3 \\ + 1.4 \\ \hline 2.7 \end{array} \quad \begin{array}{r} \text{(b)} \quad 1.8 \\ + 0.9 \\ \hline 2.7 \end{array} \quad \begin{array}{r} \text{(c)} \quad \$36.54 \\ + 2.76 \\ \hline \$39.30 \end{array}$$

9. Subtract.

$$\begin{array}{r} \text{(a)} \quad 2.9 \\ - 1.3 \\ \hline 1.6 \end{array} \quad \begin{array}{r} \text{(b)} \quad 2.6 \\ - 0.8 \\ \hline 1.8 \end{array} \quad \begin{array}{r} \text{(c)} \quad \$56.34 \\ - 8.81 \\ \hline \$47.53 \end{array}$$

10. Use $<$, $=$, or $>$.

(a) $249 \bullet 239 >$ (b) $0.6 \bullet 1.2 <$

(c) $73 \bullet 73 =$ (d) $11.8 \bullet 118 <$

11. Multiply.

$$\begin{array}{r} 52 \\ \times 7 \\ \hline 364 \end{array}$$

12. Divide.

$$6 \overline{)136} \quad 22R4$$

OBJECTIVE

To review and test selected concepts and skills previously covered

PACING

Level A All

Level B All

Level C All

RELATED AIDS

CALC. W/BK—19.

Chapters 1-6 cumulative review 183

Using the Book This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1, 2	166
3	52
4(a), 4(c)	48
4(b)	51
5(a), 6(a)	135
5(b), 6(b)	132
7	171
8(a)	139
8(b)	141
8(c)	153
9(a)	147
9(b)	149
9(c)	155
10(a), 10(c)	35
10(b), 10(d)	146
11	89
12	119

CHAPTER 7 OVERVIEW

This chapter introduces geometric solids and some of their properties. It also introduces tallying, chart reading, and discusses the interpretation and construction of pictographs.

OBJECTIVES

- A To identify, make, sort, and classify cubes, rectangular and triangular prisms
- B To introduce vertices, faces, and edges of solids, and to identify faces formed by cutting a solid
- C To identify and draw congruent line segments and right angles
- D To collect and record data in charts to use in making pictographs

MATERIALS

paper or light cardboard for making models of geometric solids
rulers
blocks or centimetre cubes
drinking straws, pipe cleaners (toothpicks, glue)
Plasticine or modelling clay
models of various kinds and sizes of solids
atlas or map

CAREER AWARENESS

Post Office Worker [209]

A post office worker can have responsibilities in many areas. One of the main duties is to staff the public

wickets selling stamps and money orders. Mathematics skills required include the making of change and facility with the multiplication facts (6 stamps at 17¢ each). Post office workers must be able to quickly and accurately find the mass of letters and parcels in order to determine the correct postage. The inside worker will also be required to sort mail and distribute it to post office boxes.

BACKGROUND

Polygons are two dimensional. That is, they have length and width, but no height or thickness. Polygons are classified as part of plane geometry.

Polyhedrons (or polyhedra) are three-dimensional shapes. That is, they have thickness or height, in addition to length and width. Polyhedrons are often referred to as solid figures. They are classified as part of solid geometry.

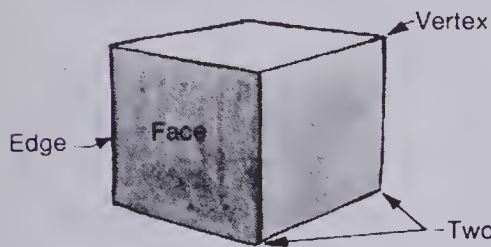
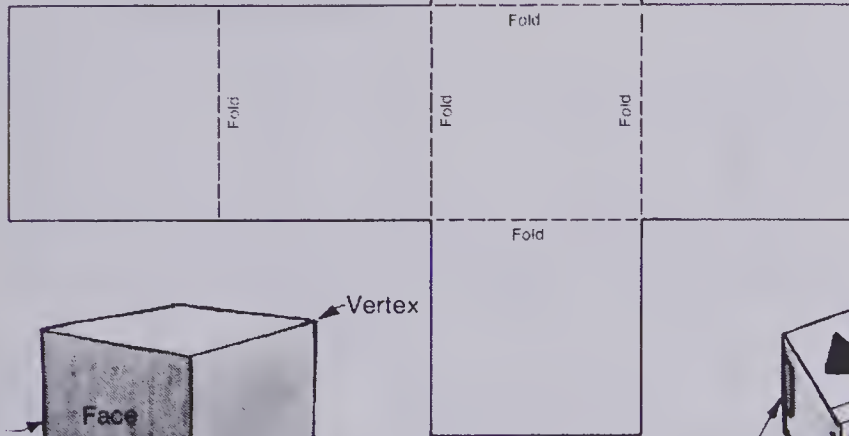
In this section with the exception of the sphere, we develop the solid shapes from the aspect of plane shapes using squares, rectangles, triangles, circles, and sections of circles.

In the graphing section, students learn to use larger scales allowing for much larger numbers.

Cubes

- Trace this pattern.
- Cut out your pattern.
- Fold and tape.

These are pictures of **cubes**.



Tape edges.

Exercises

- How many faces on a cube? ⁶ How many edges? ¹² How many vertices? ⁸
- Are the faces all the same shape? ^{yes} the same size? ^{yes}
- Are the edges all the same length? ^{yes}

Net for a cube 185

Using the Book There is value in having students draw this net. The fact that all sides are the same length becomes very evident. Also all corners are right angles. These two characteristics are paramount in defining a cube.

Ask the students to tell as much as they can about a cube.

OBJECTIVES

To make a cube from nets
To introduce vertices, faces, and edges of solid shapes

PACING

Level A All
Level B All
Level C All

VOCABULARY

vertex, vertices

MATERIALS

paper or cardboard suitable for making the model blocks or centimetre cubes

RELATED AIDS

HMS—DM51.

SUGGESTIONS

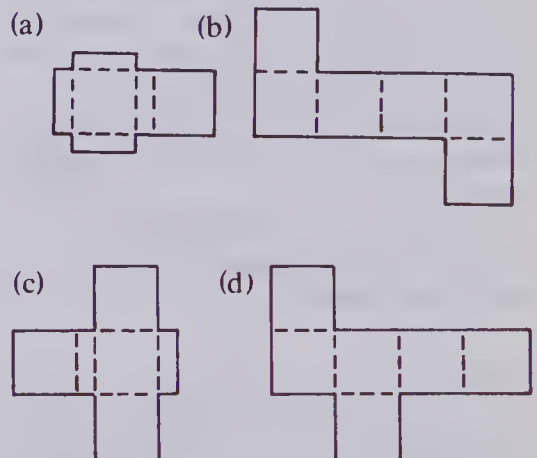
Initial Activity Have the class examine a block or similar cube. Discuss the various parts (faces, edges, vertices) of the cube and how to distinguish them. If necessary call the vertices "corners".

Depending on the proficiency of the class, you may ask them to draw (see DM51) or trace the net or you may provide cardboard with the net printed on it.

ACTIVITIES

1. Have the students make a list of objects they know about that are cubes. Compile one master list for the whole class.

2. Prepare a challenge such as: Which of these patterns will make a cube?



3. Suspend the cubes from the ceiling or in other suitable ways. You may also wish to save cubes for use as dice in the numerous games suggested in the Activities section of this text.

OBJECTIVE

To make a rectangular prism from a net

PACING

Level A All
Level B All
Level C All

VOCABULARY

prism

MATERIALS

paper or cardboard suitable for making the model (see DM51)

RELATED AIDS

HMS—DM51.

BACKGROUND

Rectangular prisms are often called cuboids. You may want to introduce this term.

SUGGESTIONS

Initial Activity Show the class models of rectangular prisms. Have them name common objects that have this general shape (shoe box, trunk, cereal box, etc.). Discuss similarities and differences in a cube and a rectangular prism (a cube is a special rectangular prism). These shapes are also called cuboids, but do not stress vocabulary. Point out that opposite sides of the rectangular prism have the same shape. This will help students to draw their own nets.

ACTIVITIES

1. Ask students to bring boxes such as dry cereal boxes. Have the students cut along the edges until the box opens and lies flat. Have the students prepare a bulletin-board display of the different types of nets that will make rectangular prisms.

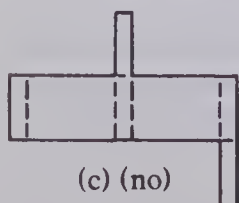
2. Provide a challenge such as: Which of these patterns will make a rectangular prism?



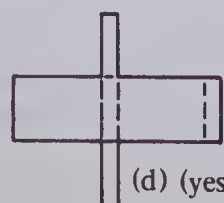
(a) (yes)



(b) (no)



(c) (no)

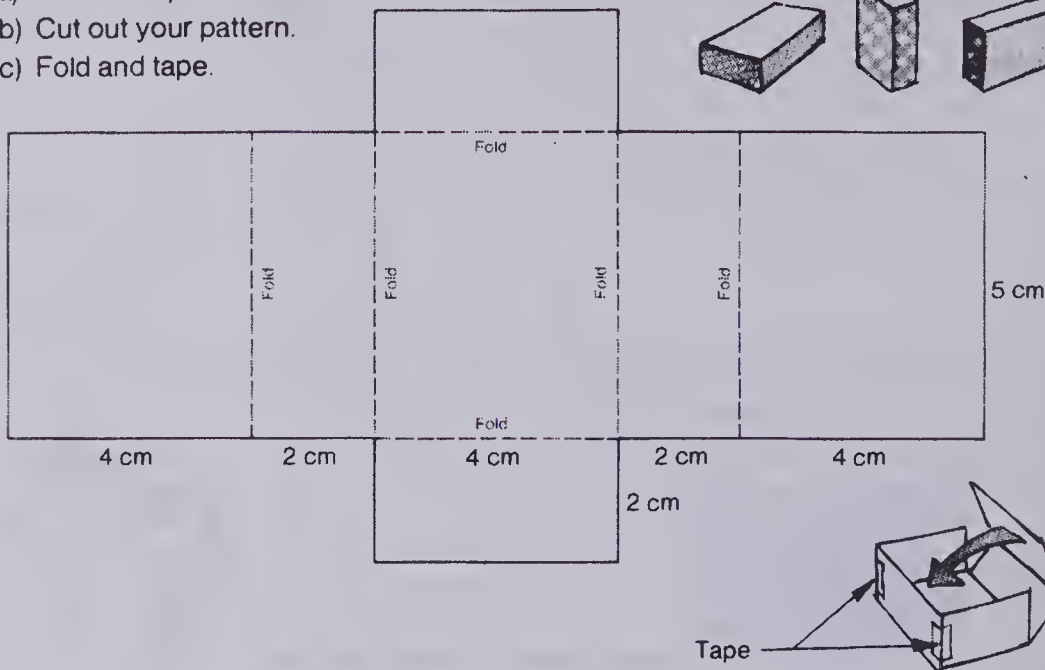


(d) (yes)

Rectangular Prisms

These are pictures of **rectangular prisms**.

- Trace this pattern.
- Cut out your pattern.
- Fold and tape.



Exercises

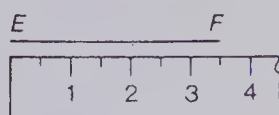
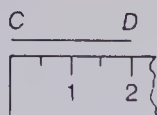
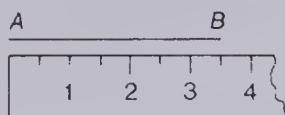
- How many faces on a rectangular prism? ⁶ How many edges? ¹² How many vertices? ⁸
- Are the faces all the same shape? ^{yes} the same size? ^{no}
- Are the edges all the same length? ^{no}

186 Net for a rectangular prism

Using the Book For some students it is preferable to provide stencils or duplicated nets ready for cutting out. For some who can manage it, it is worthwhile for them to draw their own nets. While they are drawing, discuss with individuals as you move about the class: how many of each shape they need, how many rectangles altogether, how many different lengths there are, etc. Ask the students to make a list of the properties of a rectangular prism.

3. Suspend the rectangular prisms from the ceiling or in other suitable ways, possibly together with the cubes from page 185.

Congruent Segments



AB and EF are the same length.

AB and EF are **congruent segments**.

AB and CD are not congruent.

Exercises

- Use your ruler.

Which of the following segments are congruent to MN ? TV

M N

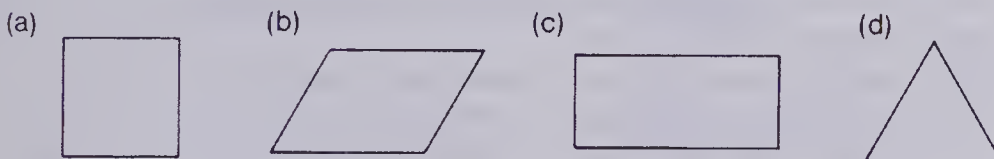
(a) R S (b) T V (c) W Z

2. Use your ruler. Which segments are congruent? Name them all. (a) and (f), (b) and (d), (c) and (e)

(a) R T (b) A S (c) V W (d) C D

(e) P Q (f) M K (g) B Z

3. Which of these shapes have *all* sides congruent? (a) and (d)



Line segments 187

OBJECTIVE

To identify and draw congruent line segments

PACING

Level A All
Level B All
Level C All

VOCABULARY

congruent segments

MATERIALS

rulers

SUGGESTIONS

Initial Activity Introduce the word "congruent" but do not ask students to define it. It is sufficient that they get the idea that congruent things are exactly the same.

Use objects in the classroom (rulers, pencils, etc.) to explain congruency.

Discuss various segments that are congruent and various segments which are not congruent.

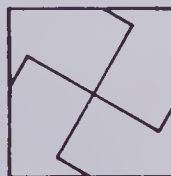
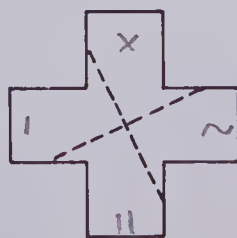
Have the students measure the sides of the cube from page 185. Ask if the sides are all congruent. Repeat for the rectangular prism.

Using the Book Discuss the display and elicit from the students that segments are congruent if they have the same measures, and conversely that if two segments have the same measures they are congruent.

ACTIVITIES

1. Direct the students to draw four segments with these lengths: 8 cm, 3 cm, 5 cm, and 10 cm. Then ask the students to draw a segment congruent to each in a different colour.

2. Draw on heavy paper this figure comprised of 5 squares. Cut it out and cut on the dotted lines. Challenge the students to assemble all the pieces to form a square.



(Answer)

3. A similar related puzzle to the one above can be found in Chapter 5, page 138, Activity 3.

EXTRA PRACTICE

Copy and complete each table. Then complete each sentence.

		Even numbers		
Even numbers	+	4	16	34
	2			
	28			

		Odd numbers		
Odd numbers	+	3	19	37
	5			
	19			

When I add an odd number and an odd number I get ____ numbers.
When I add an even number and an even number I get ____ numbers.

OBJECTIVES

To review rectangles and squares
To identify rectangular faces of
rectangular prisms and square faces
of cubes

PACING

- Level A 1-3
- Level B All
- Level C All

MATERIALS

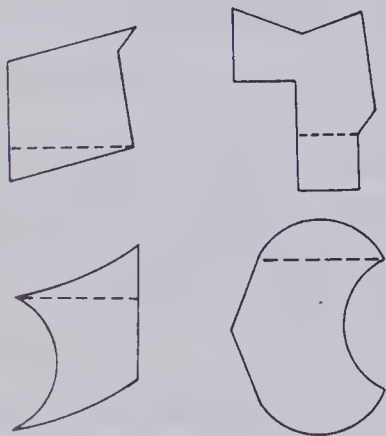
model of cube and rectangular prism

SUGGESTIONS

Initial Activity Use the models of a cube (page 185) and rectangular prism (page 186) and have students examine carefully, or trace, the faces of the models. Discuss similarities and differences in the various faces. Point out that all the faces are rectangles with some being special (i.e., squares). Note that all squares are rectangles but not all rectangles are squares.

ACTIVITIES

- Have the students make 2 lists in their books: Squares and Rectangles (which are not squares). In each the student writes the names of objects from the classroom.
- Provide the children with a copy of the shapes. Ask them to cut each out and cut along each dotted line. Then fit all the pieces together to make one large square.



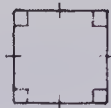
- Prepare an activity card such as:

Use four sticks to make a square.
Make lots of *separate* squares.
Make a table, like this:

Squares	1	2	3	4	5	6	7	8	9	10
Sticks	4	8								

Write multiplication, division, and fraction equations.

Squares, Rectangles, and Solids



Square



Rectangle

A **square** has 4 congruent sides and 4 square corners.

A **rectangle** has opposite sides congruent and 4 square corners.

Exercises

- (a) and (d) are squares.
(b) and (e) are rectangles.
- Which are squares and which are rectangles?
(a) (b) (c) (d) (e) (f)
 - Use the cube you made from Page 185.
What is the shape of its faces? a square
 - Use the rectangular prism you made from Page 186.
What is the shape of its faces? a rectangle
 - Name the shape each describes: cube or rectangular prism.
(a) All faces are squares. cube
(b) Some faces are rectangles. rectangular prism
(c) Some faces, not all, are squares. rectangular prism
(d) All edges are the same length. cube

188 Rectangles and squares

Using the Book Discuss the display. Point out that the small “slash marks” shown on the sides of the square and rectangle indicate congruence. Emphasize that a square is a special rectangle (because all sides are congruent).

Assign the exercises. Note that in Exercise 1, all except figures (c) and (f) are rectangles, because squares (a) and (d) are rectangles.

EXTRA PRACTICE

Copy and complete.

Odd numbers				
+	13	29	51	
12				
28				
42				

Even numbers

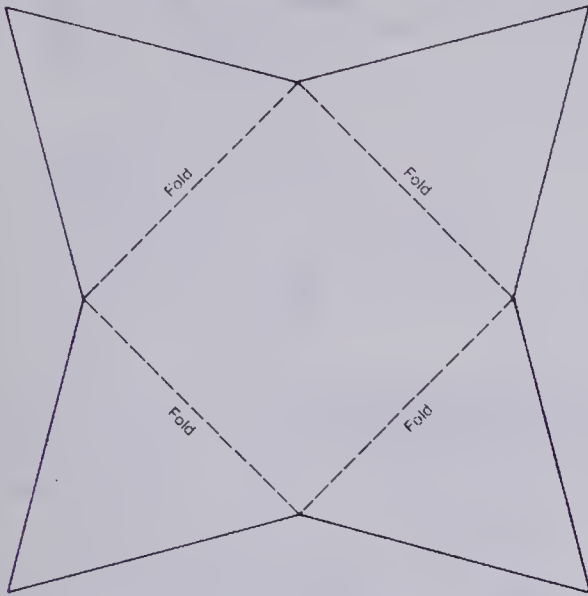
Even numbers				
+	30	56	86	
23				
47				
71				

Odd numbers

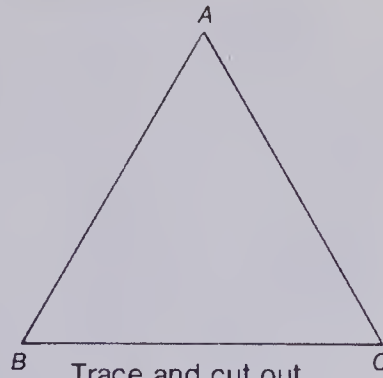
odd + even = ____
even + odd = ____

Triangles and Pyramids

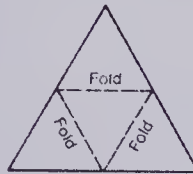
Trace this pattern to make a pyramid.



Fold and tape to make a pyramid.



Trace and cut out pattern of $\triangle ABC$. Use it to make a pattern for a pyramid.



This pattern also makes a pyramid.

Exercises

1. What shape is the bottom of the pyramid? *a square*
2. What shape are the sides? *triangles*
3. How many edges? *8* vertices? *5* faces? *5*



Pyramids 189

Using the Book If time permits, have the students make both pyramids, or have half the class make one shape and the rest of the class make the other one.

Discuss similarities and differences in the two pyramids. Point out congruent segments in each model.

OBJECTIVES

- To review triangles
- To make a model of a pyramid from a net

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

pyramid

MATERIALS

paper or cardboard suitable for making the model (see DM52)

RELATED AIDS

HMS—DM52.

SUGGESTIONS

Initial Activity Show students a picture of the Egyptian pyramids. Discuss the number of sides and the shape of each of the faces. Mention that a pyramid may have a triangular base rather than a square base. If models of pyramids are available, use them to illustrate the different kinds.

ACTIVITIES

1. Have students make a bulletin-board display of pictures of people, buildings, etc. and mark on the pictures the various geometric shapes found in the pictures.

2. Break the code by replacing each letter with a number. Each letter stands for only 1 number. Make each problem true.

TID	720	ABCD	4105	← There are others also.
ITS	279	BADC	1450	
SSS	999	DDDD	5555	

3. Suspend the pyramids from the ceiling or in other suitable ways, possibly with the other 3D shapes made to date.

OBJECTIVE

To make a triangle prism from a net

PACING

Level A All
Level B All
Level C All

VOCABULARY

prism

MATERIALS

paper or cardboard for modelling (see DM52)

RELATED AIDS

HMS—DM52.

BACKGROUND

This is a triangular-based prism. Prisms can have other types of bases such as squares (in which case the prism is a rectangular prism), pentagons, hexagons, etc.

SUGGESTIONS

Initial Activity Review the basic distinguishing features of rectangles and triangles (i.e., number of sides, corners, similar shapes, uses, etc.).

ACTIVITIES

1. If the school science room has a glass prism, have students use it to make spectrums of light by holding the prism in direct sunlight. Some students may be able to explain refraction of light.

2. Have the students make a bulletin-board display of pictures that illustrate the shapes discussed to date: cubes, rectangular prisms, pyramids, triangular prisms. Each should be labelled.

3. Suspend the prisms made as mobiles.

EXTRA PRACTICE

Subtract. Complete each statement.

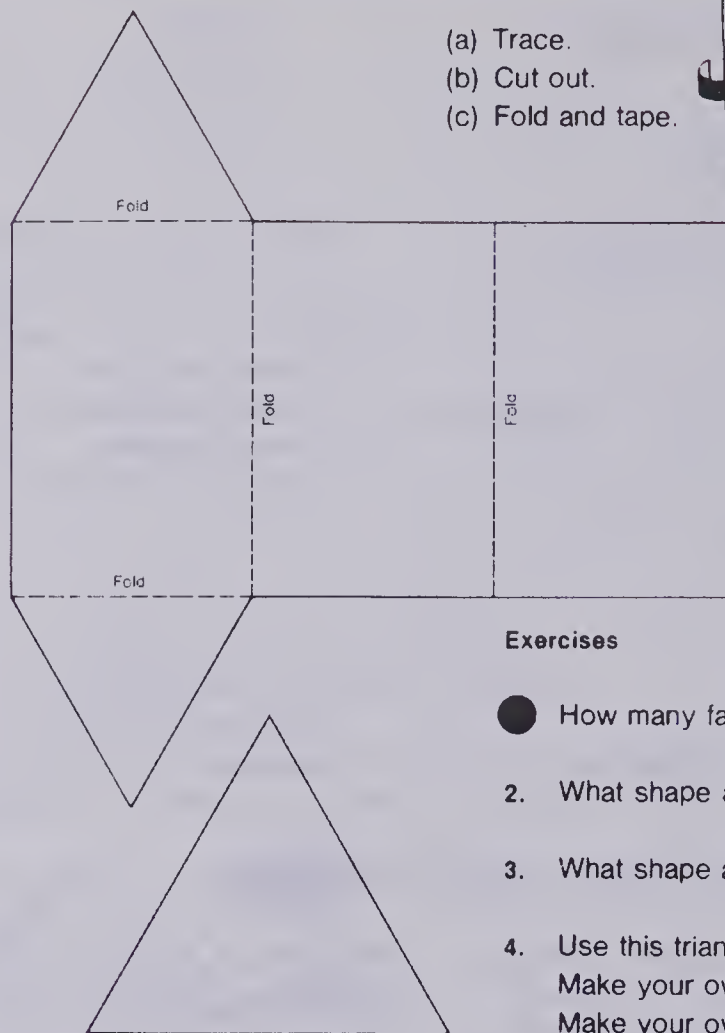
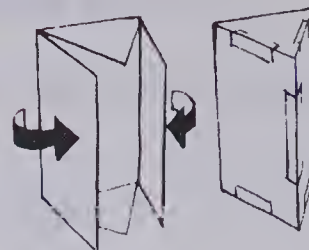
$$\begin{array}{r} \text{Even} \longrightarrow 10 \quad 38 \quad 82 \quad 1684 \\ \text{Even} \longrightarrow - 6 \quad - 22 \quad - 36 \quad - 978 \end{array}$$

$$\begin{array}{r} \text{Odd} \longrightarrow 11 \quad 33 \quad 81 \quad 1355 \\ \text{Odd} \longrightarrow - 5 \quad - 17 \quad - 39 \quad - 715 \end{array}$$

$$\begin{array}{l} \text{even} - \text{even} = \underline{\hspace{2cm}} \\ \text{odd} - \text{odd} = \underline{\hspace{2cm}} \end{array}$$

Prisms

- (a) Trace.
(b) Cut out.
(c) Fold and tape.



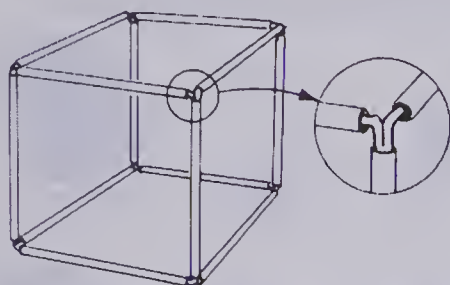
Exercises

- How many faces?⁵ edges?⁹ vertices?⁶
- What shape are the top and bottom?
triangles
- What shape are the sides?
rectangles
- Use this triangle.
Make your own pattern for a prism.
Make your own model.

Using the Book Most students will need to trace the net for the prism. For those students who wish to make their own, direct them to make the triangles (two congruent triangles) first. Then they need only make the width of the rectangles to match the particular sides of the triangles. The lengths of the rectangles is not important — they need only be the same for all rectangles.

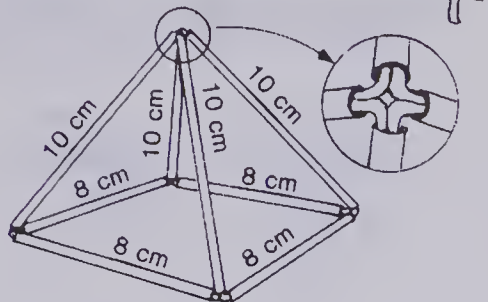
Make a cube.

1. Use 12 straws the same length (10 cm).
2. Use 8 pipe cleaners.
3. Bend each pipe cleaner.
4. Put this shape together.



Make this pyramid.

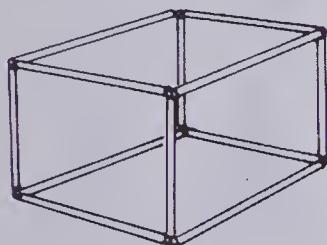
1. Use 4 straws 8 cm long.
2. Use 4 straws 10 cm long.
3. Bend one pipe cleaner for the top point.
3. Bend 4 pipe cleaners like this.



Skeleton Models

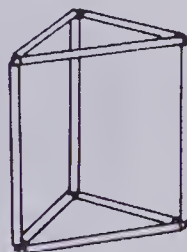
Make this prism.

1. Use 4 straws 10 cm long.
2. Use 4 straws 8 cm long.
3. Use 4 straws 6 cm long.
2. Use 8 pipe cleaners.
3. Put this shape together.



Make this prism.

1. Use 6 straws 8 cm long.
2. Use 3 straws 10 cm long.
2. Use 6 pipe cleaners.
- Put this shape together.



Skeleton models 191

OBJECTIVE

To make skeleton models of the previous four mentioned solids

PACING

Level A All
Level B All
Level C All

VOCABULARY

skeleton

MATERIALS

drinking straws, pipe cleaners, Plasticine, toothpicks, glue

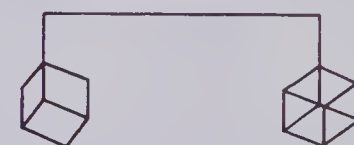
SUGGESTIONS

Initial Activity Building skeleton models will help students visualize the shapes as well as help them draw pictures of the shapes.

Students may use Plasticine, toothpicks, and glue, etc. in place of or in addition to straws and pipe cleaners. Ask: "There are two kinds of prisms. What are they? (triangular, rectangular)"

ACTIVITIES

1. Suspend from the ceiling all the models that have been made to date. Mobiles can be made—one mobile for each shape. They should be suspended so that they are available to the students.



(Solid)

(Skeleton)

Using the Book Discuss the number of edges and vertices (corners), and the number of edges that meet at each vertex. Students can work in pairs or small groups.

EXTRA PRACTICE

Subtract. Complete each statement.

Even	→	36	58	82	1378
Odd	→	<u>-11</u>	<u>-13</u>	<u>-37</u>	<u>-859</u>
Odd	→	7	15	89	2377
Even	→	<u>-2</u>	<u>-8</u>	<u>-48</u>	<u>-888</u>

even - odd = ____

odd - even = ____

OBJECTIVE

To review the cube, rectangular prism, pyramid, and triangular prism and to sort the shapes into the appropriate sets

PACING

- Level A All
- Level B All
- Level C 2

MATERIALS

models of all the shapes shown

BACKGROUND

Putting information into charts is a very important process. Some students may need help as to where a certain piece of information goes. Charts of this type help build towards the coordinate system.

ACTIVITIES

- Repeat Exercise 1 by compiling a set of pictures illustrating the shapes listed. Have the students sort the pictures under the 3 headings.
- Provide a charting activity such as:
What is the shape of each face?
Complete the chart using (✓) marks.

Type of Solid:	Shape of Each Face:		
	Triangle	Rectangle	Square
Cube			
Rectangular prism			
Pyramid			
Triangular prism			

This activity is related to and lays the groundwork for Exercise 3, page 199.

3. Ask the students to find a relation between the number of faces, edges, and vertices. (Refer to Exercise 2, page 192.) (Answer: $V + F = E + 2$.)

EXTRA PRACTICE

Multiply.

8

×

9

7

×

6

8

×

7

5

×

8

3

×

9

23

×

4

56

×

7

43

×

9

87

×

8

63

×

6

313

×

8

418

×

7

519

×

9

608

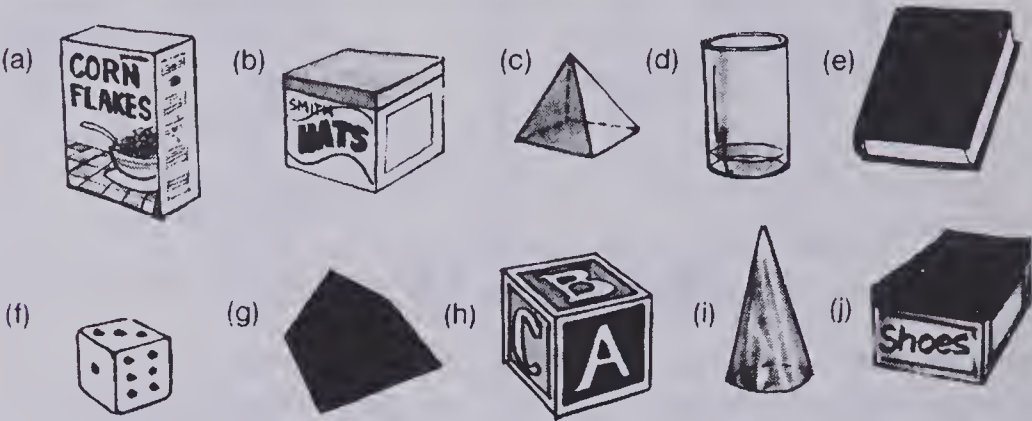
×

6

Solids

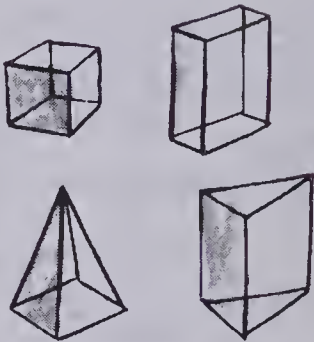
1. Make this chart.
Write the letter of each shape in the correct box.

Cube	Prism	Pyramid
(b), (f), (h)	(a), (e), (g), (j)	(c)



2. Copy and complete this chart. Use your models.

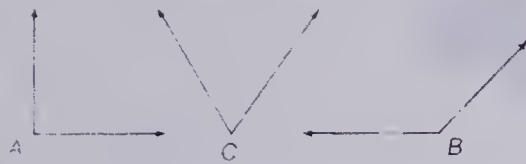
Shape	Number of		
	Faces	Edges	Vertices
Cube	6	12	8
Rectangular prism	6	12	8
Pyramid	5	8	5
Triangular prism	5	9	6



192 Recognizing solids

Using the Book Ask students to copy each chart and fill in the information. The students may need their models to complete the charts. For Exercise 2 review the meaning of face, edge, and vertex.

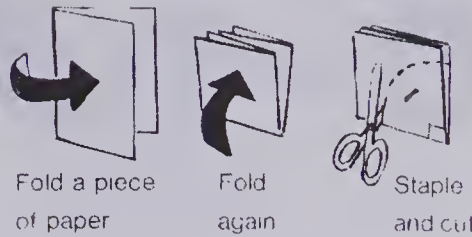
Right Angles



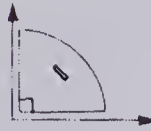
A is a **right angle**

C and B are not right angles

Make a right-angle checker



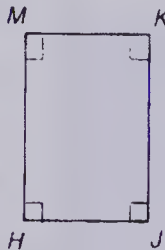
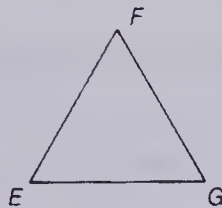
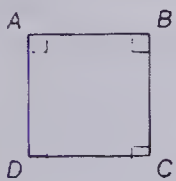
You now have a **right-angle checker**.



Exercises

- Trace your right-angle checker to draw 3 right angles in different positions. Mark each with a square.

- Use your right-angle checker. Which corners are right angles?



- Check the corners on the models you have made. How many right angles are there in each?

Right angles 193

Using the Book Have students make the right-angle checker illustrated in the display.

It is important that students be given experience in comparing angles to the right angle — some being larger and some smaller.

OBJECTIVE

To identify and draw right angles

PACING

Level A All
Level B All
Level C All

VOCABULARY

right angles

MATERIALS

heavy paper to make right-angle checkers

SUGGESTIONS

Initial Activity Introduce the right angle in a discussion on square corners. To give students some idea of the size (amount of turn) of a right angle, have students stand at attention, then make a right or left turn. Have students extend one arm directly in front of them with the other arm pointing in the direction students initially faced. The arms now form a right angle.

ACTIVITIES

- The students may be asked to list shapes and objects in the classroom that have right angles. The students may use their right-angle checkers.
- Provide a challenge such as: Count the number of
(a) triangles (7) (b) squares (3)
(c) rectangles (1 + 3) (d) right angles (13)



- Refer the students to the models they made earlier in the chapter. Ask them to list the angles less (less turning) than a right angle; greater (more turning) than a right angle (there are none greater than a right angle).

EXTRA PRACTICE

Divide.

$$8 \overline{) 64}$$

$$7 \overline{) 49}$$

$$4 \overline{) 208}$$

$$8 \overline{) 376}$$

$$5 \overline{) \$17.55}$$

$$7 \overline{) \$47.81}$$

$$8 \overline{) \$33.28}$$

$$6 \overline{) \$46.62}$$

$$6 \overline{) 54}$$

$$9 \overline{) 45}$$

$$7 \overline{) 441}$$

$$6 \overline{) 216}$$

$$9 \overline{) \$76.23}$$

$$8 \overline{) \$57.36}$$

$$7 \overline{) \$39.41}$$

$$5 \overline{) \$44.40}$$

OBJECTIVE

To make a cylinder using a net

PACING

Level A All

Level B All

Level C All

MATERIALS

paper or light cardboard suitable for making the model

RELATED AIDS

HMS—DM53.

ACTIVITIES

1. Have the students compile a list of objects that have a cylindrical shape.

2. Have the students use a tape measure to find the distance around various cylinders. You may introduce the word circumference at this time. Students will be able to relate the length of the flattened rectangle to the distance around (circumference) the cylinder.

EXTRA PRACTICE

Multiply.

$$2 \times (8 \times 6)$$

$$4 \times 9 \times 8$$

$$5 \times 7 \times 2$$

$$25 \times 7 \times 4$$

$$8 \times 20 \times 30$$

$$50 \times 20 \times 70$$

$$(3 \times 9) \times 5$$

$$7 \times 5 \times 5$$

$$9 \times 5 \times 4$$

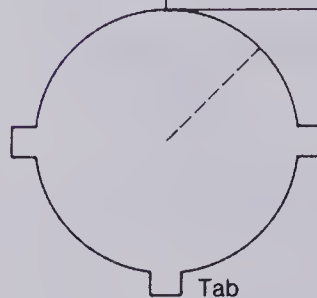
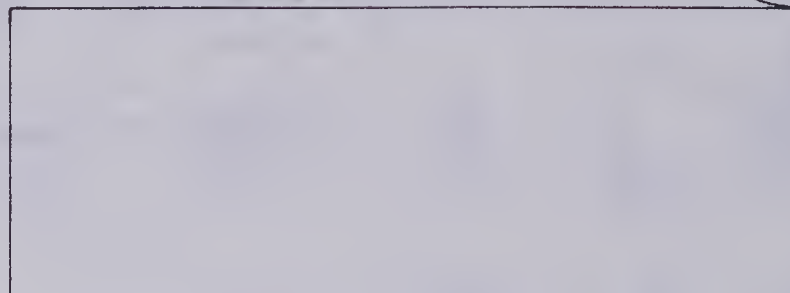
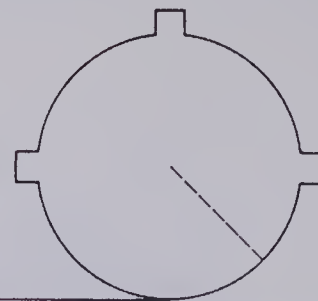
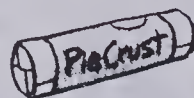
$$20 \times 9 \times 5$$

$$30 \times 20 \times 40$$

$$70 \times 50 \times 20$$

Cylinders

These are models of cylinders.

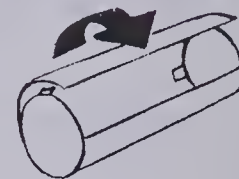


Make a cylinder.

(a) Trace and cut out.

(b) Roll and glue tabs inside.

(c) Tape joint.



Exercises

1. How many flat surfaces does a cylinder have? 2
2. How many curved surfaces are there? 1
3. What is the shape of the ends of a cylinder? circles

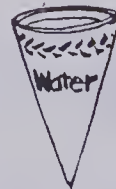
194 Cylinders

Using the Book Introduce the cylinder by talking about round containers (cans, glasses, etc.) and their properties. Have the students trace the net or you may provide cardboard with the net duplicated on it (DM53).

An alternate method is to use the tubes from toilet paper and put ends on them. However the value of the exercise as shown on this page lies in the fact the students learn that the sides of a cylinder can be opened to form a rectangle. This is important for later work where surface area is concerned. If tubes are used, have students cut the tube lengthwise and fold out the cylinder (rectangular). The tube may then be rolled and taped to make a cylinder again.

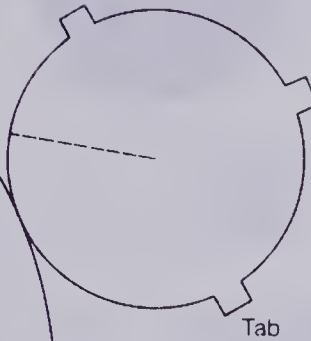
Cones

These are models of **cones**.



Make a model.

- Trace and cut out.
- Roll and glue tabs inside.
- Tape.



Exercises

- How many flat surfaces does a cone have? /
- How many curved surfaces are there? /
- What is the shape of the end? *a circle*
- How does a cone differ from a cylinder?
- How is a cone like a cylinder? *A cone has only 1 flat surface. They both roll.*

BRAINTICKLER

Use the numbers 0 to 10.
The sum of two corners is
in the box.

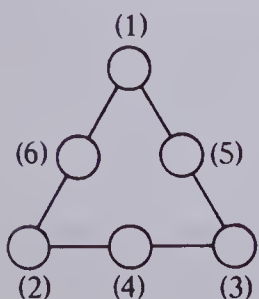


Cones 195

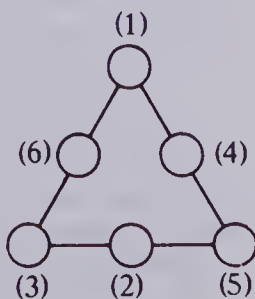
Using the Book The students will need to trace this pattern as the dimensions are critical. You may wish to prepare duplicated patterns ready for cutting out and assembling (see DM53). Do not be concerned if the models are crude. Students will be encouraged to construct these in subsequent grades also, and their models will improve. This is a learning process. Encourage students to answer orally the 5 exercises on page 195. The need to verbalize enhances this learning process.

ACTIVITIES

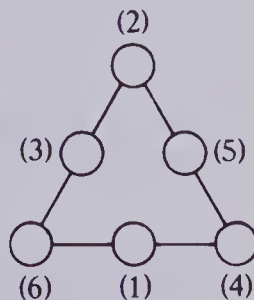
- Use these extensions of the Braintickler:
Use the numbers 1 through 6. (Answers are given in brackets.)



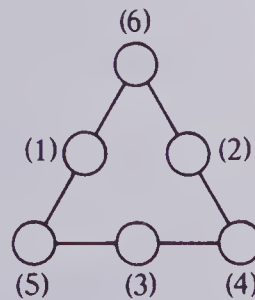
Sum 9



Sum 10



Sum 11



Sum 12

- Have the students compile a list of objects that have shapes like a cone.
- Ask the students to fill a cone with water and pour it into a cylinder (can) with the same diameter and height. Repeat until the cylinder is

OBJECTIVE

To make a cone from a net

PACING

Level A All
Level B All
Level C All

MATERIALS

paper or light cardboard suitable for making the model

RELATED AIDS

HMS—DM53.

SUGGESTIONS

Initial Activity Have students describe ice-cream cones, sno cones, pine cones, etc. Most students will be able to recognize a cone but will be unfamiliar with the net for a cone.

filled. How many times more does the cylinder hold than the cone? (three)

EXTRA PRACTICE

Multiply.

3×10 45×10 319×10
 7×100 43×100 283×100
 4×1000 72×1000 519×1000

Divide.

$80 \div 10$ $710 \div 10$ $230 \div 10$
 $600 \div 100$ $800 \div 100$ $400 \div 100$
 $7000 \div 1000$ $6000 \div 1000$ $8000 \div 1000$

OBJECTIVE

To make a sphere from Plasticine or modelling clay

PACING

Level A All

Level B All

Level C All

MATERIALS

Plasticine or modelling clay

SUGGESTIONS

Initial Activity Prepare a display of various-sized spheres (marbles, small and large balls, etc.) and discuss the similarities and differences of the spheres. Have students compare spheres with the other shapes discussed previously. Emphasize that there are no edges nor vertices on a sphere.

ACTIVITIES

1. Have students collect pictures from magazines and newspapers and make a collage of real-world spheres. Display on the bulletin board.

2. Have the students make up riddles for other students similar to:

I have 1 face.

I have 1 vertex.

I roll.

Who am I? (cone)

Mount these riddles on index cards.

3. Ask students to use their imaginations and see if they can find the distance around a sphere without using a tape measure. They can use a string and measure the length of the string or mark a point on the sphere and roll the sphere until the point has made one complete revolution, then measure the straight line distance of the roll, etc.

Spheres

Make a **sphere**.

Use Plasticine.



Shape Plasticine into a ball.

Models

Spheres



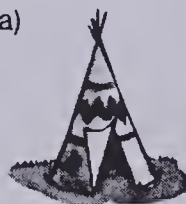
Exercises

- What is another name for a ball? *a sphere*
2. How many flat surfaces does a sphere have? *0*
3. Name 5 objects that have the shape of a sphere.

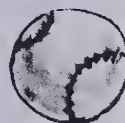
4. Match.

(i) Cone (a), (d) (ii) Cylinder (c) (iii) Sphere (b)

(a)



(b)



(c)



(d)



196 Spheres

Using the Book Have students make spheres from Plasticine or modelling clay as suggested in the display.

Do Exercises 1-4 orally.

Sorting

Refer to shapes (a) to (h) for Questions 1, 2, and 3.

- Draw two loops and label as shown.
Place the letter of each shape in one of the loops.

d, f, h

b, d, e, g

All surfaces flat.

Not all surfaces flat.

2. Repeat Number 1 using these loops.

a, b

c, d, e, f, g, h

All edges congruent. Not all edges congruent.

3. (a) Repeat Number 1 using these loops.

b, d, e, g

a, c, f, h

At least one curved surface.

No curved surfaces.

(b) How does this compare with Number 1?
The same shapes are grouped together.

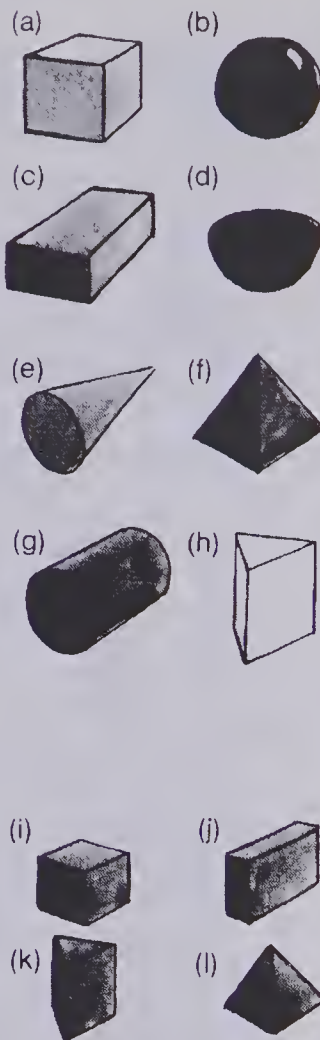
4. Use these loops to sort the shapes in (i), (j), (k), and (l).

i, j

k, l

All angles are right angles.

Not all angles are right angles.



OBJECTIVES

To sort solids according to different rules

To use "all" and "not all" in sorting

PACING

Level A All

Level B All

Level C All

MATERIALS

models of the shapes shown

BACKGROUND

Statements including "all" and "not all" are very difficult for students. Similarly, "at least one . . ." and "no . . ." are difficult.

SUGGESTIONS

Initial Activity With the class, practice sorting using cubes, cones, spheres and cylinders. Ask students to pick out the shapes with (a) "all surfaces flat", (b) "not all surfaces flat". Discuss. Ask students to sort these shapes using a different attribute (all surfaces curved, shapes with no curved surfaces, etc.). At this time use "all . . ." and "not all . . ." attributes.

Using the Book Correct this work by having a student or students do the actual sorting, then compare their answers with the sorting results. (Use chalk to label each model A, B, C, etc. as labelled on the page.) Elicit from the students statements using "all" and "not all". Discuss situations involving "at least one . . ." and "no . . ." as in Exercise 3.

ACTIVITIES

- Assemble a collection of objects such as screws, nails, nuts, bolts, washers. Ask the student to sort according to prescribed rules such as:
 - has threads; has no threads
 - has a hole; has no hole
 - has a head; has no head
 - Make up your own rule.

2. Allow students to go on a scavenger hunt in the school and school yard. Their task is to locate an object like each of the solid shapes. They may bring the items back to the classroom or just record the articles by name or by drawing pictures of the items.

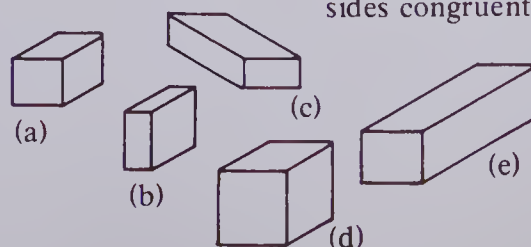
3. Play "Triple Concentration". The general rules for "Concentration" are described in the Activity Reservoir. "Triple Concentration" requires 3 cards to make a matched set. Seven of the 21-card deck should show a drawing of

these shapes: cube, rectangular prism, pyramid with square base, triangular prism, cylinder, cone, and sphere. Seven cards should show the word name for these shapes. The 7 remaining cards should read: all edges congruent, a shoe box, has 5 faces, has 6 vertices, has 2 flat surfaces, has 1 vertex, has no edges.

EXTRA PRACTICE

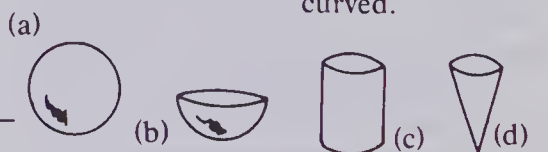
1. Sort the shapes using these loops.

All angles right angles and all sides congruent. All angles right angles but not all sides congruent.



2. Sort the shapes using these loops.

All surfaces curved. Not all surfaces curved.



3. Sort the shapes in Extra Practice 2, using these loops.

No flat surfaces. Has a flat surface.

4. Copy and complete.

- One apple costs 20¢.
Two apples cost ____¢.
Ten apples cost ____¢.
- One litre of juice costs 40¢.
Two litres cost ____¢.
One half litre costs ____¢.
One quarter litre costs ____¢.
One and a half litres cost ____¢.
Two and a half litres cost ____¢.
- 1000 m of fuel cost \$800.
100 m cost \$____.
200 m cost \$____.
250 m cost \$____.
500 m cost \$____.
750 m cost \$____.

OBJECTIVE

To classify shapes using multiple properties

PACING

Level A 1
Level B All
Level C All

MATERIALS

models of shapes

SUGGESTIONS

Initial Activity Display sets of shapes matching those in the tables.

This classifying exercise is conceptually difficult since it involves "all" and "not all". Discuss the concepts with the students to distinguish the meaning of each.

ACTIVITIES

1. Have students draw pictures using only one shape (various sizes), examples: "circle man", "prism palace", "cube growing trees".

2. Construct animals using various sizes of one shape (Plasticine) and pipe cleaners or straws (e.g., Crafty cube — small cube for head, large cube for body, cube buttons, etc.).

3. Use a set of Attribute Blocks and have students make their own rules for each sorting. The students should record their rules for sorting.

EXTRA PRACTICE

Match.





- (a) All angles right angles and all sides congruent.
- (b) All angles right angles but *not* all sides congruent.
- (c) All sides *not* congruent and all angles not right angles.
- (i) Triangular-based prism
- (ii) Cube
- (iii) Rectangular prism

Classifying Shapes




Copy the tables.

Place a check mark or number in each space that fits.

1.

Shapes	Properties				
	All angles right angles	All surfaces flat	All edges congruent	All faces have 4 sides	Some faces have 3 sides
	✓	✓	✓	✓	
	✓	✓		✓	
		✓			✓
		✓			✓

2.

Shape	Properties				
	All surfaces curved	Only one flat surface	Two flat surfaces	One pointed end	Name
			✓		cylinder
		✓		✓	cone
	✓				sphere

198 Classifying solids

Using the Book In discussing the page, it may occur to you that some students may have check marks in the right places by guessing. Hence, there is a need to listen to the students telling you about the shapes.

Both exercises may be repeated over several days. Do them orally by displaying the models on a table. Then ask a student to pick out those shapes that have . . . (then name each property as listed). If necessary you may pick up each shape in turn and ask, "Are all the angles in this shape right angles?", etc.

Naming Solids

1. Copy each name.

Write beside each name the letter of each shape that looks like the solid named.

Cube (h)

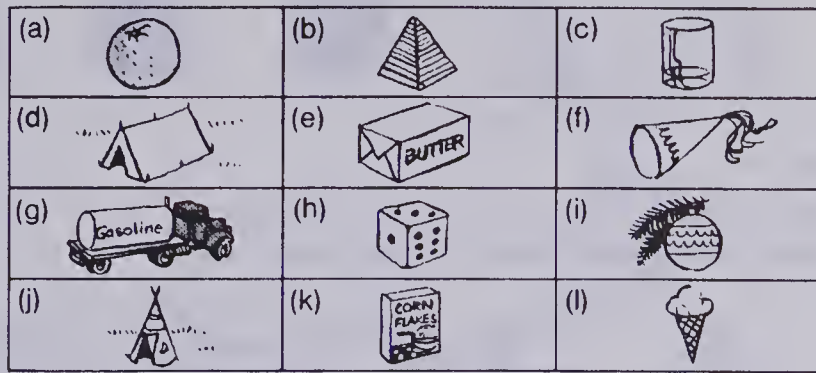
Pyramid (b)

Cone (f), (j), (l)

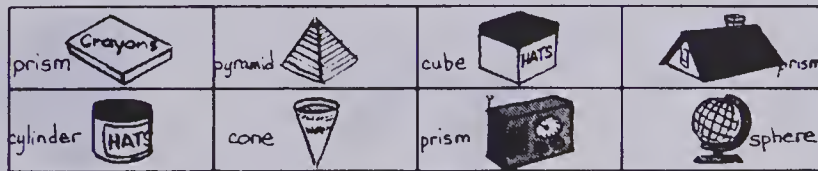
Cylinder (c), (g)

Sphere (a), (i)





Prism (d), (e), (k)



2. Write the name for each shape.



3. How many rectangles, squares, and triangles does each shape have?

Shape	Rectangles	Squares	Triangles
	0	1	4
	3	0	2
	0	6	0
	6	0	0

Recognizing solids 199

Using the Book This page may be completed either orally or as an individual workbook assignment. Should you choose the latter, be certain children know exactly what constitutes a correct written response.

OBJECTIVE

To identify and name solids

PACING

Level A All

Level B All

Level C All

SUGGESTIONS

Initial Activity Review the various shapes encountered in this chapter. Discuss examples of each shape that students encounter in daily living.

ACTIVITIES

1. Prepare 2 sets of cards (or use part of the deck from Activity 3, page 197). One set contains pictures of objects that illustrate the shapes studied in this chapter. On the other are names of the shapes. The students are to match the shapes and the names. For ease of correcting, the backs of all cubes may be labelled A's; all the cones B's, etc. **Variation.** Do not label the backs. Use the two decks shuffled and play "Snap".

2. Prepare a set of dominoes (see "Dominoes" in the Activity Reservoir), using pictures and names: cube, rectangular prism, triangular pyramid, square-base pyramid, rectangle, square, right angle, triangle, cone, cylinder, sphere.

3. Put the solids in a paper bag. Form two teams. A student reaches into the bag and selects one object. The student must name the object before withdrawing it. If the student is correct, verified upon removal from the bag, that team gets a point. Teams take turns reaching into the bag.

EXTRA PRACTICE

Tell what solid shape is described.

- 6 flat square faces all the same size and all angles right angles.
- 1 pointed end, 1 flat circular end, and rest is curved.
- 6 flat faces not all the same size, all angles right angles.
- 1 square face, 4 triangular faces.
- 2 flat circular ends, rest curved.
- Whole surface is curved.
- 2 triangular faces, 3 rectangular faces.

OBJECTIVE

To make Plasticine models, cut across them, trace and name the new faces

PACING

Level A All
Level B All
Level C All

MATERIALS

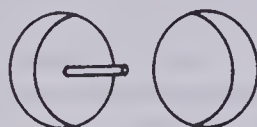
Plasticine or modelling clay (a wire cheese cutter is useful)

SUGGESTIONS

Initial Activity Show students how to use a knife suitable for cutting the shapes as shown. Wire cheese cutters cut Plasticine easily. Caution students about the need to perform these exercises with extreme care.

ACTIVITIES

1. You may wish to prepare styrofoam models precut and fastened together with pipe cleaners. Students can take them apart on the various slices and trace the faces.



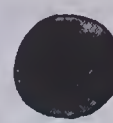
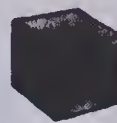
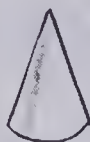
2. If students have been able to cut the models and trace the new faces with relative ease they may enjoy making other cuts (vertical, horizontal, or diagonal) to examine other faces. Some of the new faces may be unfamiliar shapes. Have students trace and describe how these faces were obtained.

3. Prepare a set of exercises similar to this:
Choose the face that will be produced when the cone is cut as shown.



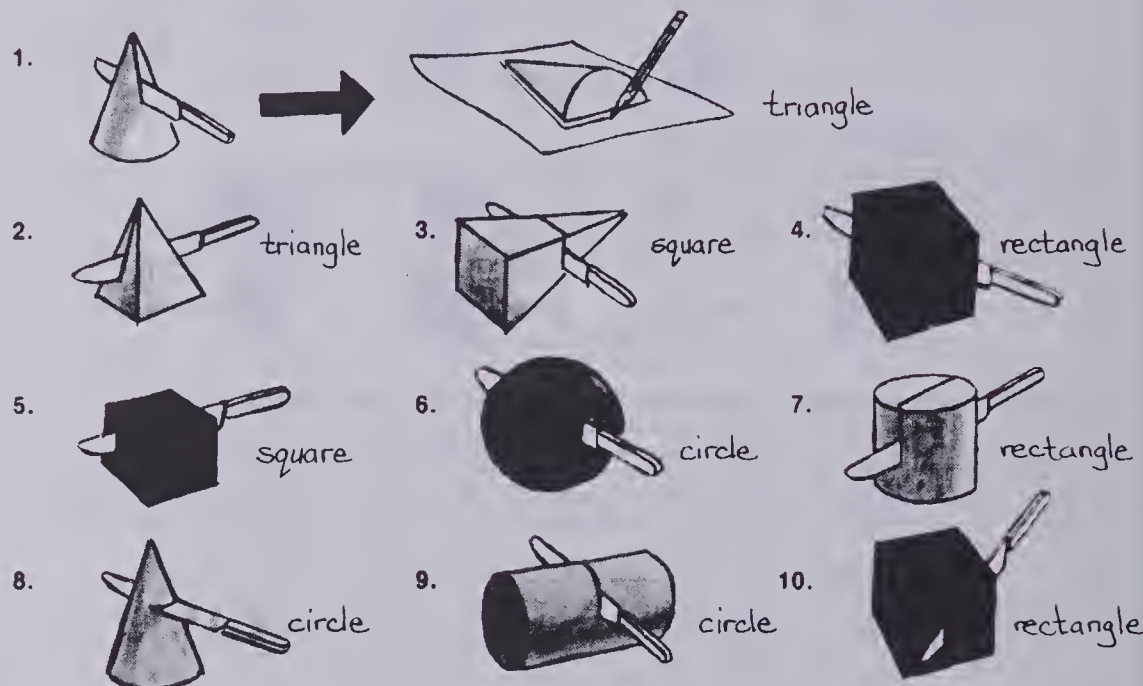
Cutting Models

Make these shapes from Plasticine.



Exercises

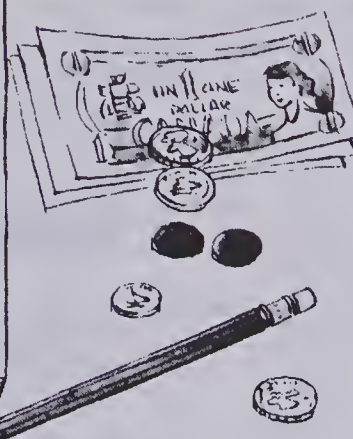
Use a knife or wire to cut each shape as shown.
Trace the new faces. Name each shape you draw.



200 Cross-sections

Using the Book Assign the class into groups with specific shapes (not all) assigned to different groups. Then have each group tell the others about what they found. They can show the shapes they made, the new faces obtained, and the tracings of the new faces.

Keeping Track of Money



	July	August
Earned:		
Allowance	\$3.50	\$3.50
Paper route	3.35	7.25
Spent:		
Movies	2.25	1.50
Bicycle repairs		3.10
Ice cream	2.45	
Saved:		
	2.15	1.65

- How much did Marty earn in July? \$ 6.85
- How much allowance did Marty get in the two months? \$ 7.00
3. How much did Marty earn in August? \$ 10.75
4. How much did Marty spend in July? August? \$ 4.70, \$ 4.60
5. How much did Marty save in the two months? \$ 3.80
6. How much more did Marty save in July than in August? \$ 0.50
7. How much more did Marty earn in August than in July? \$ 3.90
8. How much more did Marty spend on movies in July than in August? \$ 0.75
- ★ 9. How much more did Marty spend in July than in August? \$ 0.10
- ★ 10. How much more did Marty earn than he spent in July? in August? \$ 2.15, \$ 6.15

Using charts, problems with many questions 201

Using the Book Discuss with the class what information is contained in the chart. Ask such questions as: (a) Which two numbers make up Marty's income for July? (b) Which two numbers represent his expenses for August? (c) Which two numbers represent his savings for the two months?

Point out that some questions require 2 answers, as in Exercise 4. Exercises 9 and 10 involve using answers from other exercises.

OBJECTIVE

To develop skills in problem solving using information from a chart

PACING

Level A 1-6, 8

Level B 1-8

Level C 3-10

VOCABULARY

allowance, earned, spent, saved

SUGGESTIONS

Initial Activity Explain to students that a chart is one way of presenting a great deal of information using limited space. One of the skills students must acquire is to be able to choose the required information from all the given data. To do this, it is necessary to examine the entire chart before attempting to use it so that one knows exactly what information is in the chart.

ACTIVITIES

1. Have each student cut out a chart from a newspaper or magazine and write five or six questions which can be answered by using the chart.

2. Make a bulletin-board display using charts and questions gathered by students.

3. Have the students prepare a list of ways they can earn money. They may also prepare a list of where they spend money. Discuss saving money by using a bank account.

OBJECTIVE

To read and interpret a road chart giving distances in kilometres

PACING

- Level A All
- Level B All
- Level C All

MATERIALS

atlas or map with chart showing distances in kilometres

SUGGESTIONS

Initial Activity Use a distance chart found in the school atlas and explain how to use it. Be certain that the format used is similar to that at the top of page 202.

ACTIVITIES

1. Obtain a provincial road map with a chart showing distances in kilometres. Using 2 towns listed in the chart, ask, "How far is it from ____ to ____?" Have a student locate the 2 towns on the map. Repeat for other towns or cities.
2. Repeat Activity 1, using a road map of Canada. Prepare a list of cities for which the students will find the distances between.
3. For an added twist, provide a distance chart as described in Activity 1. Ask questions such as: (a) Which cities are 592 km apart? (b) Plan a travel holiday which includes 3 cities. List them and tell the total travel distance.

EXTRA PRACTICE

- Find the distance from:
- (a) Penticton to Prince Rupert
 - (b) Vancouver to Penticton
 - (c) Prince Rupert to Victoria
 - (d) Victoria to Vancouver
 - (e) Prince George to Prince Rupert
 - (f) Vancouver to Prince Rupert
 - (g) Victoria to Prince George.

	Penticton	Prince George	Prince Rupert	Vancouver	Victoria
Penticton		761	1500	402	553
Prince George	761		739	795	946
Prince Rupert	1500	739		1533	1685
Vancouver	402	795	1533		151
Victoria	553	946	1685	151	

Reading Charts

A road chart is shown giving the distances in kilometres between cities.

	B	Lethbridge	Calgary	Dawson Creek, B.C.	Edmonton	Jasper	Medicine Hat
A							
Lethbridge			218	1105	517	632	170
Calgary		218		888	299	1018	293
Dawson Creek, B.C.		1105	888		592	859	1172
Edmonton		517	299	592		367	583
Jasper		632	1018	859	367		711
Medicine Hat		170	293	1172	583	711	

- To find the distance from Edmonton to Dawson Creek:
- (a) Find Edmonton in Column A.
 - (b) Go across the row to the Dawson Creek Column.
 - (c) Read the distance in kilometres: 592 km.

Exercises

Use the road chart in the display. Find the distance from:

- 1. Lethbridge to Edmonton 517 km
- 2. Jasper to Medicine Hat 711 km
- 3. Dawson Creek to Calgary 888 km
- 4. Calgary to Jasper 1018 km
- 5. Medicine Hat to Lethbridge 170 km
- 6. Edmonton to Medicine Hat 583 km
- 7. Jasper to Edmonton 367 km
- 8. Medicine Hat to Jasper. 711 km

Using the Book You may wish to introduce the terms "horizontal" and "vertical" to develop an intuitive understanding at this stage. For example: "Find Edmonton in Column A. Go across horizontally to the Dawson Creek column.", etc. Then illustrate commutativity (not the word please) by saying "Find Edmonton in Row B. Go down vertically to the Dawson Creek row.", etc.

Tune Up

Add.

$$\begin{array}{r} 1. \quad 36 \\ + 28 \\ \hline 64 \end{array}$$

$$\begin{array}{r} 2. \quad 71 \\ + 29 \\ \hline 100 \end{array}$$

$$\begin{array}{r} 3. \quad 845 \\ + 154 \\ \hline 999 \end{array}$$

$$\begin{array}{r} 4. \quad 339 \\ + 579 \\ \hline 918 \end{array}$$

$$\begin{array}{r} 5. \quad 560 \\ + 209 \\ \hline 769 \end{array}$$

$$\begin{array}{r} 6. \quad 4231 \\ + 1612 \\ \hline 5843 \end{array}$$

$$\begin{array}{r} 7. \quad 1294 \\ + 6158 \\ \hline 7452 \end{array}$$

$$\begin{array}{r} 8. \quad 3141 \\ + 1493 \\ \hline 4634 \end{array}$$

$$\begin{array}{r} 9. \quad 1411 \\ + 2314 \\ \hline 3725 \end{array}$$

$$\begin{array}{r} 10. \quad 4103 \\ + 1099 \\ \hline 5202 \end{array}$$

Subtract.

$$\begin{array}{r} 11. \quad 82 \\ - 36 \\ \hline 46 \end{array}$$

$$\begin{array}{r} 12. \quad 98 \\ - 79 \\ \hline 19 \end{array}$$

$$\begin{array}{r} 13. \quad 412 \\ - 203 \\ \hline 209 \end{array}$$

$$\begin{array}{r} 14. \quad 874 \\ - 587 \\ \hline 287 \end{array}$$

$$\begin{array}{r} 15. \quad 603 \\ - 104 \\ \hline 499 \end{array}$$

$$\begin{array}{r} 16. \quad 7889 \\ - 2581 \\ \hline 5308 \end{array}$$

$$\begin{array}{r} 17. \quad 3894 \\ - 1766 \\ \hline 2128 \end{array}$$

$$\begin{array}{r} 18. \quad 4536 \\ - 1469 \\ \hline 3067 \end{array}$$

$$\begin{array}{r} 19. \quad 9156 \\ - 6467 \\ \hline 2689 \end{array}$$

$$\begin{array}{r} 20. \quad 8700 \\ - 2711 \\ \hline 5989 \end{array}$$

Multiply.

$$\begin{array}{r} 21. \quad 18 \\ \times 3 \\ \hline 54 \end{array}$$

$$\begin{array}{r} 22. \quad 46 \\ \times 5 \\ \hline 230 \end{array}$$

$$\begin{array}{r} 23. \quad 36 \\ \times 10 \\ \hline 360 \end{array}$$

$$\begin{array}{r} 24. \quad 72 \\ \times 6 \\ \hline 432 \end{array}$$

$$\begin{array}{r} 25. \quad 32 \\ \times 8 \\ \hline 256 \end{array}$$

$$\begin{array}{r} 26. \quad 71 \\ \times 1000 \\ \hline 71000 \end{array}$$

$$\begin{array}{r} 27. \quad 327 \\ \times 9 \\ \hline 2943 \end{array}$$

$$\begin{array}{r} 28. \quad 258 \\ \times 7 \\ \hline 1806 \end{array}$$

$$29. \quad 3 \times 1 \times 5 = \blacksquare \quad 15$$

$$\begin{array}{r} \text{Divide. } 9 \\ 30. \quad 9 \overline{)81} \\ \underline{12R3} \end{array}$$

$$\begin{array}{r} 31. \quad 5 \overline{)95} \\ \underline{27R2} \end{array}$$

$$\begin{array}{r} 32. \quad 8 \overline{)168} \\ \underline{28R4} \end{array}$$

$$\begin{array}{r} 33. \quad 5 \overline{)455} \\ \underline{93} \end{array}$$

$$\begin{array}{r} 34. \quad 8 \overline{)174} \\ \underline{40} \end{array}$$

$$35. \quad 7 \overline{)87}$$

$$36. \quad 5 \overline{)137}$$

$$37. \quad 6 \overline{)172}$$

$$38. \quad 3 \overline{)279}$$

$$39. \quad 10 \overline{)400}$$

Computational practice 203

Using the Book Use this page to diagnose areas requiring more practice. This chart shows where these skills are presented in the text.

Exercise	Topic	Page
1, 2	2-digit addition with regrouping	7
3, 5	3-digit addition without regrouping	17
4	3-digit addition with regrouping	19
6-10	4-digit addition with regrouping	38
11, 12	2-digit subtraction with regrouping	22
13-15	3-digit subtraction with regrouping	24
16-20	4-digit subtraction with regrouping	42
21, 22, 24, 25	Multiplication of 2 digits by 1 digit with regrouping	89
23, 26	Multiplication by 10, 100, 1000	79
27, 28	Multiplication of 3 digits by 1 digit with regrouping	94
29	Multiplication with 3 factors	82
30	Division by 9	109
31-38	Division, 2-digit quotients, with and without remainders	119-121
39	Division by powers of 10	122

Note particularly the multiplication and division since these skills are used in the following pages.

Level A students may be assigned the balance of the exercises as additional practice in subsequent lessons.

OBJECTIVE

To practise computation

PACING

Level A 1-6, 11-16, 21-39

Level B 3-8, 13-18, 21-39

Level C 6-10, 16-20, 24-29, 32-39

ACTIVITIES

1. Reproduce this crossnumber puzzle for your students. (Answers are given.)

a	3	1		b	4	c	5	d	6
	4		e	3	0	4			
		f	9	2				g	8
h	7	6	5			i	1	4	
	3			j	4	0			
k	8	9	7			l	3	9	

ACROSS

a $64 - 33$

b $312 + 144$

e $785 - 481$

f 4×23

h $999 - 234$

i $8 \overline{)112}$

j 10×4

k 897×1

l $390 \div 10$

DOWN

a $3400 \div 100$

b $400 \div 10$

c $634 - 580$

e $741 - 416$

f 8×12

g 7×12

h $988 - 250$

i $4 \overline{)412}$

2. Play "Marathon" as described in the Activity Reservoir to practise computational skills.

OBJECTIVES

To review reading and interpreting pictographs

To make pictographs using:

- (a) 1 symbol for 2 items
- (b) 1 symbol for 5 items

PACING

Level A 1-7

Level B 2-8

Level C 2-8

VOCABULARY

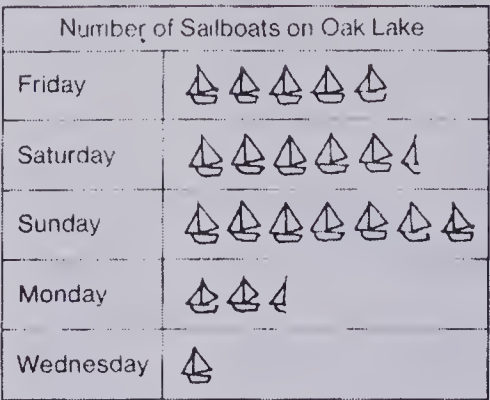
represents


SUGGESTIONS

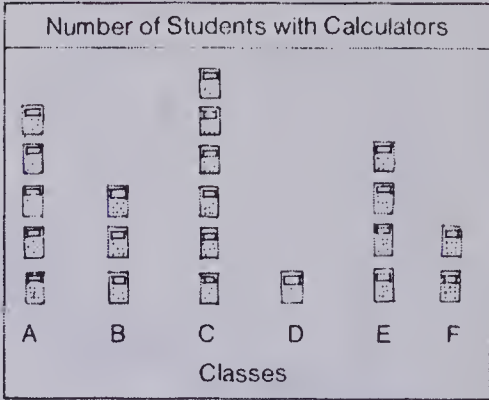
Initial Activity Explain that pictographs are very similar to charts except that pictures are used to provide information. Point out that the three necessary parts of a picture graph are the title, the symbol and what it represents, and one additional piece of information (days of week, classes, colour, etc.).


Choosing a suitable number for each symbol to represent is one of the most difficult tasks involved in drawing pictographs. Some students will require additional practice in this skill before drawing the graphs.

Pictographs




 represents 2 boats.




 represents 5 students.

Use the pictographs in the displays.


1. ● How many sailboats are represented by  ? 2

● What days does the graph show? Friday, Saturday, Sunday, Monday, Wednesday

● What does the symbol  represent? 1 boat



(d) How many sailboats were on the lake each day? See graph.

(e) On which day were there twice as many as on Monday? Friday

(f) On which day were the fewest boats on the lake? Wednesday
2. (a) What does the symbol  represent? 5 students

(b) In which class do the most students have calculators? the fewest? C, D

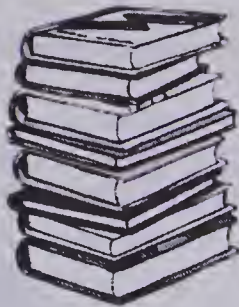
(c) How many calculators are there in all the classes together? 105
3. Why are these graphs called pictographs? Pictures (symbols) are used in the graphs.






































Using the Book Discuss the two display graphs with the class. Note the three required parts of the graph. Point out that  represents 2 boats and that  represents 5 students. Have students pay particular attention to the “half symbol” representation and its meaning.


Assign the exercises. Review with the students the accepted answer format.

4. Copy and complete the pictograph to show this information. Label.

Brian 8
Kathy 22
Brenda 7
Hank 18
Jan 15



Number of Books Students Read in a Year	
Brian	   
Kathy	         
Brenda	   
Hank	         
Jan	        

 represents 2 books.

Make a pictograph for each set of information. Label each.

Select your own symbol. Decide how many each symbol will represent.

5.

Millimetres of Rain	
Monday	5 mm
Tuesday	10 mm
Wednesday	0 mm
Thursday	20 mm
Friday	25 mm
Saturday	35 mm
Sunday	9 mm

6.

Kites Flown in the Parks	
Central Park	8 kites
River Park	24 kites
Hillside Park	15 kites
Crescent Park	7 kites
Memorial Park	5 kites

7.

Favourite Sport of Students	
Swimming	12 students
Hiking	16 students
Bowling	2 students
Ball	5 students
Skiing	4 students
Skateboarding	15 students

8.

Birds Seen on a Hike	
Ducks	95
Red-wing Blackbirds	35
Robins	20
Bluebirds	5
Geese	75
Jays	55

ACTIVITIES

1. Have students make a potato print in art class and then use the print as a symbol for a picture graph of their choice.

2. More capable students may use an encyclopedia or yearbook to find the population of each of Canada's provinces. Have them make a pictograph illustrating the population. Each symbol will have to represent a much larger number than any used to date.

EXTRA PRACTICE

Choose 6 lines of print in a book; count the number of times each vowel is used. Show the information in a graph. Select your own symbol.

OBJECTIVE

To collect data for graphing

PACING

Level A 1-3

Level B All

Level C All

SUGGESTIONS

Initial Activity Explain that one method of keeping a count of various items is to use a tally mark. To help organize and simplify counting of marks, tallies are often grouped in fives (four vertical and one crossing) as they are recorded.

Demonstrate by asking the class in recording with tallies, such questions as: "Do you like cheese?", "How many people are wearing something brown?", etc.

Some students may require a review of counting by fives for rapid calculation of the number of tallies.

EXTRA PRACTICE

1. Choose 3 lines in a book. Record the number of times each of the following consonants occur: b, d, f, k, m, q, x, z.

2. Have students survey the number of cars, trucks, buses, etc. that pass a particular intersection during a 5 min period.

3. One of the longest words in the English language is: pneumonoultramicroscopicsilicovolcanoconiosis. It is the name of a lung disease among miners. Prepare a chart showing the number of times each letter occurs.

Collecting Data

Mark and Mary used tally marks to record the number of each animal they saw on their hike.



Number of Animals We Saw While Hiking	
Squirrels	### ### ### ### 1 21
Moose	3
Coyotes	### 1 6
Sheep	### ### ### 17
Chipmunks	### 9



● How many of each animal did Mark and Mary see?
See graph

2. How would they indicate 3 bears? 19 deer?

Prepare a chart using tally marks to show the information.
Label your chart.

3.

Cars Passing School	
Red	8
Yellow	27
Green	5
Blue	19

4.

Blossoms on One Plant	
Wild Rose	38
Columbine	17
Aster	12
Bluebell	28

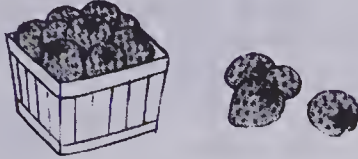
206 Tally charts

Using the Book Discuss the display. Suggest that students write the number of tally marks recorded at the end of each line when a count has been made (when working in their own books).

Assign the exercises.

Reading Pictographs

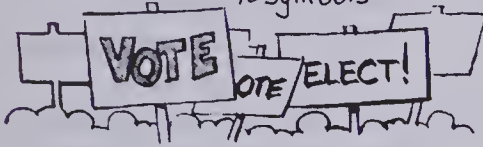
- How many litres of strawberries did Cheryl pick each day? See graph.
- Find the average number of litres Cheryl picked each day. 67L
- Cheryl picked 105 L on Saturday. How would this be shown? 10½ symbols



Litres of Strawberries	
Day	Strawberries Cheryl Picked
Monday	50L
Tuesday	35L
Wednesday	75L
Thursday	85L
Friday	90L

represents 10 L.

- Who won the election? Mr. Bobbit
- How many votes were counted altogether? 1700
- How would you show 900 votes? 9 symbols
1000 votes? 950 votes? 9½ symbols
10 symbols



Community Election	
Candidate	Number of Votes
Ms. Lizabeth	300
Mr. Joseph	200
Ms. Francis	450
Mr. Bobbit	500
Ms. Jill	250

represents 100 votes.

- Which village has the greatest Wawa population? the smallest? Oil Springs
- What is the population of each village? See graph.
- How would you show 2000 people? 4 symbols

Populations of 4 Villages	
Village	Population
Oil Springs	500
Southampton	1500
Port Dover	3000
Wawa	5000

represents 500 people.

Using the Book Before assigning the page, emphasize what each symbol represents in the three pictographs. You might ask: "In the first pictograph what does 1 represent? 5 ?" In the second pictograph ask, "What does 1 represent? How would you represent 150 votes?"

Some students may need assistance with the reading. To assist, you may do these orally with these students.

OBJECTIVE

To read pictographs where each symbol represents (a) 10 (b) 100 (c) 500 items.

PACING

Level A 1-6
Level B 4-9
Level C 4-9

SUGGESTIONS

Initial Activity Review counting by 10's, 100's, and 500's.

ACTIVITIES

Bring to class (or have the students bring) pictographs from newspapers and magazines. Discuss the message each conveys. Do not be too specific regarding detail. Remember, the primary objective of a pictograph is to convey a visual message — the detail is secondary.

EXTRA PRACTICE

Heights of Trees	
Tree	Height in Metres
Pine	150
Sequoia	350
Cedar	200
Giant Redwood	300

represents 50 m.

- Which tree is the tallest? the shortest?
- How tall is each tree?
- How would you show the height of 150 m? 250 m?

OBJECTIVE

To make pictographs where a symbol represents 10 items

PACING

Level A All
Level B All
Level C 2, 3

MATERIALS

centimetre or 2 cm graph paper

SUGGESTIONS

Initial Activity Review the necessary components of a pictograph (title, symbol, identifying name or class). Some students require additional practice in deciding on and using symbol representation.

Review counting by 5's and 10's.

ACTIVITIES

1. Have students make a pictograph using actual objects as symbols (tree leaves, bottle caps, can labels, etc.). Glue the objects on a sheet of paper in the required number to make a graph.

2. Design a bulletin-board display of student graphs. You may wish to have children interview and collect (using the tally system) information from school children and display the resulting pictographs in a prominent location in the school.

3. Have students draw pictographs for one or more of the Activities on page 206.

Drawing Pictographs

- Complete the pictograph. The Grade 4 classes had a bicycle relay around the school.

Class	Number of Laps
4A	30
4B	40
4C	60
4D	80
4E	50

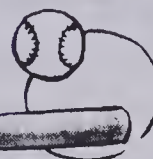


Title	
Class	Number of Laps
4A	☼ ☼ ☼
4B	☼ ☼ ☼ ☼
4C	☼ ☼ ☼ ☼ ☼ ☼
4D	☼ ☼ ☼ ☼ ☼ ☼ ☼ ☼
4E	☼ ☼ ☼ ☼ ☼

☼ represents 10 laps.

- The Grade 4 classes entered sports competitions. The points each class won were recorded.

Class	Points Earned
4A	60
4B	70
4C	35
4D	90
4E	55



- The Grade 4 classes recorded the number of students from each class that entered the sports events. Draw the pictograph.

Draw the pictograph.

- Choose a picture symbol.
- Decide how many points each symbol will represent.
- Decide how many symbols are needed for each class.
- Draw the graph and symbols.
- Label and title your graph.

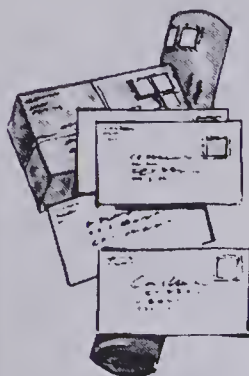
Class	Number Entering
4A	20
4B	40
4C	50
4D	35
4E	15

Using the Book In Exercises 2 and 3, if one symbol represents 10 is used, then half symbols will be required.

The use of 2 cm graph paper assists the students in making attractive graphs.

Post Office Worker

- Copy and complete the 50 times chart.



$50 \times 1 = 50$	$50 \times 6 = \blacksquare$
$50 \times 2 = \blacksquare 100$	$50 \times 7 = \blacksquare$
$50 \times 3 = 150$	$50 \times 8 = \blacksquare$
$50 \times 4 = \blacksquare 200$	$50 \times 9 = \blacksquare$
$50 \times 5 = \blacksquare 250$	$50 \times 10 = \blacksquare$



Draw pictographs. Use one symbol to represent 50 items

- | Letter Deliveries | | |
|-------------------|----------------|------------|
| Carrier | Houses Visited | |
| Mr. Dean | 200 | 4 symbols |
| Ms. Craig | 350 | 7 symbols |
| Mr. Waters | 550 | 11 symbols |
| Mrs. Baird | 100 | 2 symbols |
| Mrs. Tracy | 450 | 9 symbols |

- | Parcel Deliveries | | |
|-------------------|--------|------------|
| Name | Number | |
| Mr. O'Hare | 250 | 5 symbols |
| Mrs. Gratski | 500 | 10 symbols |
| Mr. Brodova | 150 | 3 symbols |
| Ms. Hoff | 550 | 11 symbols |
| Mr. Youngman | 400 | 8 symbols |

Use one symbol to represent 100 items in these graphs.

- | Letters Delivered | | |
|-------------------|--------|------------|
| Day | Number | |
| Monday | 800 | 8 symbols |
| Tuesday | 900 | 9 symbols |
| Wednesday | 300 | 3 symbols |
| Thursday | 700 | 7 symbols |
| Friday | 550 | 5½ symbols |

- | Stamps Sold | | |
|-------------|--------|------------|
| Kind | Number | |
| 10¢ | 700 | 7 symbols |
| 12¢ | 1500 | 15 symbols |
| 25¢ | 500 | 5 symbols |
| 50¢ | 400 | 4 symbols |
| \$1.00 | 100 | 1 symbol |

Pictographs 209

Using the Book Assign Exercises 1 and 2. If no difficulties arise, have all students do Exercise 4 to review the use of one half a symbol. Assign the remainder of the page, only if students require it. Have the students use graph paper to help keep their graphs legible.

OBJECTIVE

To draw pictographs using 1 symbol to represent (a) 50 (b) 100 items

PACING

Level A 1-4
Level B 2-4
Level C 2, 4, 5

MATERIALS

centimetre or 2 cm graph paper

SUGGESTIONS

Initial Activity Review by counting by 25's, 50's, and 100's. Discuss the work of post office workers (see the "Career Awareness" section in the Chapter Overview (page 184).

ACTIVITIES

1. Assign students a library project to gather as much information as possible on a famous mathematician or on a career which interests them.

2. Invite a post office worker to discuss his/her job with the class. Prepare for the visit by compiling a list of questions the members of the class wish to ask.

EXTRA PRACTICE

1. Robbie checked the topics of library books.

Topic	Number of Books
Travel	50
Mysteries	250
Adventure	450
Sports	325
Science Fiction	75

Draw the pictograph.

Use 1 symbol to represent 50 books.

2.

Potatoes Picked by Students	
Name	Number of Kilograms
Usko	□ □ □ □ □
Esko	□ □ □ □ □ □ □ □
Brisko	□ □ □ □ □ □ □ □
Mac	□ □ □ □ □ □ □ □

□ represents 100 kg.

- Who picked the most potatoes?
- How many kilograms of potatoes did each person pick?
- Find the average number of kilograms picked by the students.

OBJECTIVE

To evaluate achievement of the chapter objectives

PACING


- Level A All
- Level B All
- Level C All


RELATED AIDS

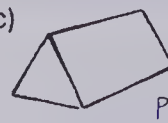
HMS—DM54.

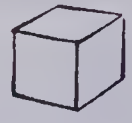
Chapter Test

1. Name each shape.

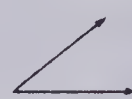
(a)  sphere

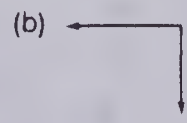
(b)  cone


(c)  prism


(d)  cube

2. Which of these are right angles? (b) and (c)


(a) 

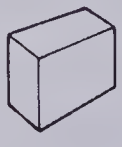
(b) 

(c) 


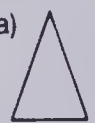



(d) 

3. Record the number of edges, faces, and vertices in each solid.





















Pyramid  8 edges
5 faces
5 vertices

Prism  12 edges
6 faces
8 vertices

4. Choose the face the cut will produce.

 (a)  (b)  (c)  (d) 


5. Harry sells papers.

Day	Number of Papers Sold
Saturday	   
Sunday	     
Tuesday	 
Thursday	       

(a) On which day did Harry sell the most papers? the fewest? Thursday Tuesday

(b) How many papers did he sell on Saturday? 40

(c) How many papers did he sell on Tuesday? 15

 represents 10 papers.

Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 184).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1	A	185, 190, 195, 196
2	C	193
3	B	186, 189
4	B	200
5	D	204-209

Cumulative Review

Topic	Number of Books
Travel	50 <i>1 symbol</i>
Mysteries	250 <i>5 symbols</i>
Adventure	450 <i>9 symbols</i>
Sports	325 <i>6½ symbols</i>
Science Fiction	75 <i>1½ symbols</i>

1. Robbie checked the kinds of books in the library.

Use Robbie's table to draw a pictograph.

Use one symbol to represent 50 books.

2. Rewrite using our numerals.

(a) xxix *29* (b) xc *90* (c) lxxxii *82*

3. Add.

$$\begin{array}{r} (a) \quad 625 \\ + 74 \\ \hline 699 \end{array}$$

$$\begin{array}{r} (b) \quad \$80.14 \\ + 39.96 \\ \hline \$120.10 \end{array}$$

4. Subtract.

$$\begin{array}{r} (a) \quad 652 \\ - 418 \\ \hline 234 \end{array}$$

$$\begin{array}{r} (b) \quad \$84.80 \\ - 38.92 \\ \hline \$45.88 \end{array}$$

5. Give the meaning of the coloured digit.

(a) 731
3 tens

(b) 5432
4 hundreds

(c) 456
6 ones

6. Use >, <, or =

(a) 3751 ● 3732 > (b) 4653 ● 4468 > (c) 56.4 ● 564 <

7. Multiply.

(a) 4×32 *128* (b) 7×46 *322* (c) 6×321 *1926* (d) 8×641 *5128*

8. Divide.

(a) $54 \div 9$ *6* (b) $128 \div 4$ *32* (c) $5 \overline{)365}$ *73* (d) $9 \overline{)873}$ *97*

OBJECTIVE

To review and test selected concepts and skills previously covered

PACING

Level A All

Level B All

Level C All

Using the Book This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1	209
2	56
3(a)	17
3(b)	153
4(a)	24
4(b)	155
5(a), 5(c)	16
5(b)	33
6	146
7(a), 7(b)	89
7(c), 7(d)	91
8(a)	109
8(b)-8(d)	117

CHAPTER 8 OVERVIEW

This chapter extends the understanding of fractions and decimals; addition and subtraction and comparison of decimals is extended to include hundredths. Fractions with common denominators are added and subtracted. Fractional parts of a set are also calculated.

OBJECTIVES

- A To write hundredths in decimal form; to name and identify the place value of a digit involving wholes, tenths, and hundredths
- B To compare numbers involving decimals and hundredths
- C To add and subtract decimals (to hundredths) with and without regrouping
- D To round a decimal (tenths) number to the nearest whole, to the nearest 10's, 100's, and 1000's
- E To change fractions to decimals; to add and subtract fractions (with common denominators); to find a fractional part of a set

MATERIALS

tenth's and hundredth's grids
place-value pocket chart
abacus
number line in tenths
game cards, bottle caps, button cards

BACKGROUND

There is a definite move to developing addition and subtraction of decimals earlier than common fractions. Hence, addition and subtraction of decimals and

hundredths comes before comparable work with fractions. However, the fraction and decimal models are tied together to provide ability to change certain fractions to decimals. One of the common uses of fractions is introduced — that of calculating a fractional part (unit fraction) of a set.

CAREER AWARENESS

Engineers [235]

There are many kinds of engineers — electrical, aeronautical, hydraulic, etc. Reference here is made to those involved in the construction business, such as in the construction of bridges, towers, and buildings (civil engineers).

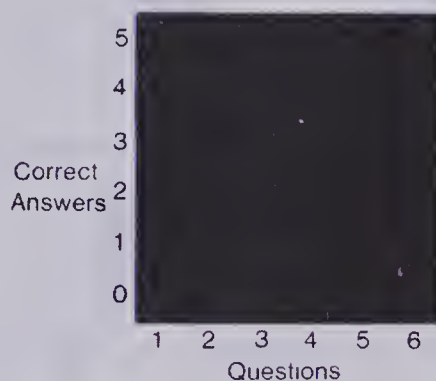
Very often engineers must travel from one construction site to another. They are responsible for establishing the specifications of a building project — the design, dimensions, and types of materials. They help at the planning stage by interpreting the architect's idea and putting it into practical terms. How deep, and of what sort, should the foundations be to support such a structure? What are the plumbing and electrical requirements? What do the building codes specify? These are just some of the questions that engineers help to answer. They also work with the builder, decoding and translating complicated blue prints, suggesting the methods and order in which the project should be completed.

An engineer needs to be skilled and knowledgeable in mathematics and science. They are graduates of universities.

Tune Up

1. (a) $\begin{array}{r} 27 \\ + 48 \\ \hline 75 \end{array}$ (b) $\begin{array}{r} 35 \\ + 36 \\ \hline 71 \end{array}$ (c) $\begin{array}{r} 80 \\ + 65 \\ \hline 145 \end{array}$ (d) $\begin{array}{r} 47 \\ + 59 \\ \hline 106 \end{array}$ (e) $\begin{array}{r} 248 \\ + 506 \\ \hline 754 \end{array}$
2. (a) $\begin{array}{r} 320 \\ + 858 \\ \hline 1178 \end{array}$ (b) $\begin{array}{r} 685 \\ + 337 \\ \hline 1022 \end{array}$ (c) $\begin{array}{r} 6520 \\ + 2807 \\ \hline 9327 \end{array}$ (d) $\begin{array}{r} 5634 \\ + 2706 \\ \hline 8340 \end{array}$ (e) $\begin{array}{r} 7068 \\ + 4375 \\ \hline 11443 \end{array}$
3. (a) $\begin{array}{r} 2.3 \\ + 0.2 \\ \hline 2.5 \end{array}$ (b) $\begin{array}{r} 6.4 \\ + 2.8 \\ \hline 9.2 \end{array}$ (c) $\begin{array}{r} 7.3 \\ + 8.8 \\ \hline 16.1 \end{array}$ (d) $\begin{array}{r} 24.7 \\ + 19.5 \\ \hline 44.2 \end{array}$ (e) $\begin{array}{r} \$25.68 \\ + 14.19 \\ \hline \$39.87 \end{array}$
4. (a) $\begin{array}{r} 80 \\ - 37 \\ \hline 43 \end{array}$ (b) $\begin{array}{r} 72 \\ - 46 \\ \hline 26 \end{array}$ (c) $\begin{array}{r} 65 \\ - 38 \\ \hline 27 \end{array}$ (d) $\begin{array}{r} 103 \\ - 37 \\ \hline 66 \end{array}$ (e) $\begin{array}{r} 125 \\ - 66 \\ \hline 59 \end{array}$
5. (a) $\begin{array}{r} 463 \\ - 208 \\ \hline 255 \end{array}$ (b) $\begin{array}{r} 650 \\ - 376 \\ \hline 274 \end{array}$ (c) $\begin{array}{r} 504 \\ - 236 \\ \hline 268 \end{array}$ (d) $\begin{array}{r} 1874 \\ - 965 \\ \hline 909 \end{array}$ (e) $\begin{array}{r} 4309 \\ - 1418 \\ \hline 2891 \end{array}$
6. (a) $\begin{array}{r} 8.2 \\ - 0.7 \\ \hline 7.5 \end{array}$ (b) $\begin{array}{r} 7.0 \\ - 3.6 \\ \hline 3.4 \end{array}$
 (c) $\begin{array}{r} \$37.00 \\ - 28.80 \\ \hline \$8.20 \end{array}$ (d) $\begin{array}{r} \$41.20 \\ - 20.70 \\ \hline \$20.50 \end{array}$
 (e) $\$92.54 - \$37.06 = \blacksquare \$55.48$

Copy the chart. Graph your results.



OBJECTIVE

To review addition and subtraction forms for whole numbers and decimals presented to date

PACING

Level A All
Level B All
Level C All

ACTIVITIES

You may wish to use some of the numerous computational practice games suggested in the Activity Reservoir or select from the Activities described on the pages where the skills were developed.

Addition and subtraction practice **213**

Using the Book This page is designed to review and maintain skills in addition. You may wish to assign the page as part of your on-going drill program or you may wish to use it as an informal testing device. Whatever the case, it is recommended that the page be assigned over a number of sittings or periods, particularly for less-able students.

Computation has two aspects: accuracy and speed. While no time limit is indicated or recommended here, you may wish to have each individual student record his or her time for each set of questions. The table below shows exactly where the skills are presented in the text:

Exercise	Topic	Page
1(a)-1(d)	2-digit addition with regrouping	7
1(e), 2(a), 2(b)	3-digit addition with regrouping	19
2(c)-2(e)	4-digit addition with regrouping	38
3(a)-3(d)	Addition of decimals (tenths) with regrouping	148
3(e)	Addition of money	153
4(a)-4(c)	2-digit subtraction with regrouping	22
4(d)-5(c)	3-digit subtraction with regrouping	24
5(d), 5(e)	4-digit subtraction with regrouping	42
6(a), 6(b)	Subtraction of decimals (tenths) with regrouping	149
6(c)-6(e)	Subtraction of money	155

OBJECTIVE

To develop the concept of hundredths

PACING

Level A All
Level B All
Level C All

MATERIALS

copies of tenth's and hundredth's grids

VOCABULARY

hundredths

RELATED AIDS

HMS—DM55.

SUGGESTIONS

Initial Activity Introduce the tenth's grid and the hundredth's grid (see DM55). Discuss how many hundredths in a tenth (in each column). Explain the tenth's grid is like dimes and the hundredth's grid is like pennies — 10 dimes in a dollar, 10 pennies in a dime, and 100 pennies in a dollar.

Ask questions such as:

If you had 4 dimes, how many pennies would you want in exchange?

If you had 30 pennies, how many dimes would you want in exchange?

If you had \$1.00, how many dimes (pennies) would you want in exchange?

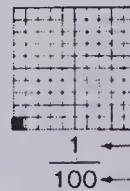
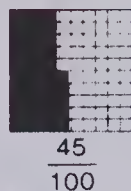
Review fractions and their meanings. Remind the children that the bottom number of a fraction tells how many parts the one (whole) was divided into and the top number tells how many parts are shaded (or we have taken or we can see, etc.).

ACTIVITIES

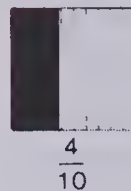
1. Provide students with worksheets on which are hundredth's grids. Have the students indicate given hundredths ($\frac{50}{100}$, $\frac{5}{100}$, etc.) by colouring or shading parts of the diagram.

2. Play "Bingo" as described in the Activity Reservoir. Use playing cards or sheets worked in hundredths (e.g., from $\frac{1}{100}$ to $\frac{35}{100}$). Use an overhead projector, transparency of a hundredth's grid and coloured water colour markers to display matching fraction pictures.

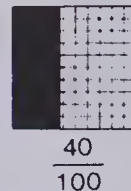
Hundredths



1 ← number of parts shaded
100 ← number of parts in all



=



=

Exercises

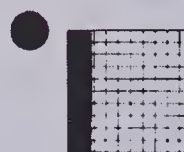
Write the fraction for the shaded part.



$\frac{2}{10}$



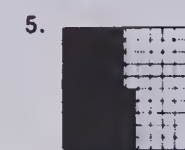
$\frac{6}{10}$



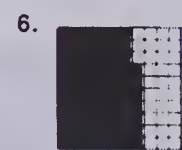
$\frac{20}{100}$



$\frac{35}{100}$



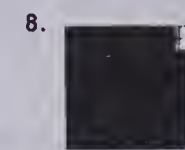
$\frac{55}{100}$



$\frac{67}{100}$

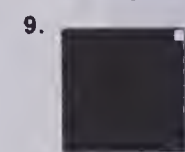


$\frac{5}{100}$

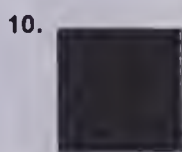


$\frac{98}{100}$

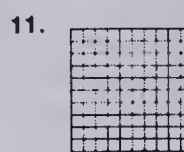
How many hundredths are shaded? Write as a fraction.



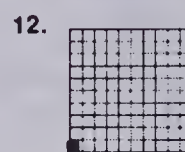
$\frac{99}{100}$



$\frac{100}{100}$



$\frac{0}{100}$



$\frac{1}{100}$

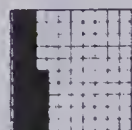
13. Write 1 as hundredths. $1 = \frac{100}{100}$

14. Write 0 as hundredths. $0 = \frac{0}{100}$

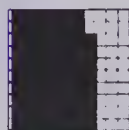
Using the Book You may do this page orally. You may wish to demonstrate (or have the children demonstrate) the situation pictured in the exercises. If so, provide tenth's and hundredth's grids (see DM55).

Hundredths as Decimals

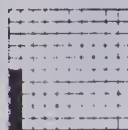
We can write hundredths as decimals.



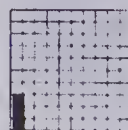
$$\frac{25}{100} = 0.25$$



$$\frac{68}{100} = 0.68$$



$$\frac{5}{100} = 0.05$$

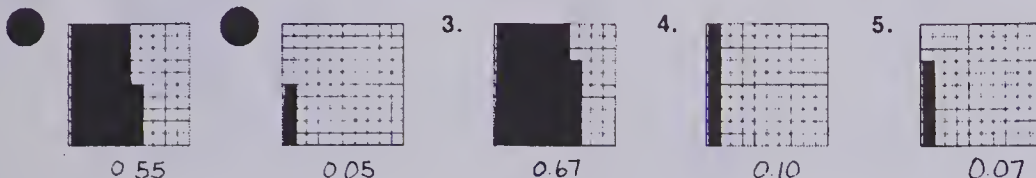


$$\frac{3}{100} = 0.03$$

Be careful of these!

Exercises

Write the decimal for each.



6. Write the decimal for each name. Remember the zero in front of the decimal.

(a) thirty hundredths 0.30 (b) six hundredths 0.06 (c) seventy-four hundredths 0.74

7. Write the decimal for each.

(a) $\frac{3}{100}$ 0.38 (b) $\frac{27}{100}$ 0.27 (c) $\frac{6}{100}$ 0.06 (d) $\frac{90}{100}$ 0.90 (e) $\frac{9}{10}$ 0.9

(f) $\frac{47}{100}$ 0.47 (g) $\frac{11}{100}$ 0.11 (h) $\frac{7}{10}$ 0.7 (i) $\frac{71}{100}$ 0.71 (j) $\frac{17}{100}$ 0.17

8. Write each as a fraction.

(a) 0.50 $\frac{50}{100}$ (b) 0.65 $\frac{65}{100}$ (c) 0.75 $\frac{75}{100}$ (d) 0.07 $\frac{7}{100}$ (e) 0.04 $\frac{4}{100}$

Decimal notation 215

OBJECTIVE

To write hundredths in decimal form

PACING

Level A All
Level B All
Level C 1-6; 7(a), (c), (e), (h); 8

RELATED AIDS

HMS—DM55.

SUGGESTIONS

Initial Activity Review place value of whole numbers (ones, tens, and hundreds). Note particularly, numbers like 20, 40, etc. and emphasize the reason for putting the two and four in the places they occupy.

Review the writing of tenths as decimals (pages 132-135). Emphasize that three tenths is written as 0.3 because there are no ones. Also note that numbers have different names; $\frac{1}{10}$, 0.1. Then introduce the hundredth's number line and identify some points by using fraction names for the value $\frac{3}{100}$, $\frac{29}{100}$, etc.

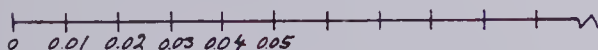
Using the Book Discuss the display. Emphasize that 0.05 shows there are no ones and no tenths (see display) in the number. You may wish to compare 0.05 and 0.03 to 0.50 and 0.30.

Do Exercises 1-5 orally. Assign the rest.

ACTIVITIES

1. Provide students with a grid marked in hundredths (DM55). Write decimals on the chalkboard for the students to indicate by colouring on the grid, i.e., (a) eighteen hundredths (b) seventy-two hundredths.

2. On a strip of adding machine paper over 1 m long, mark a line segment 1 m long and place a tick at each centimetre. Start numbering as shown. Let the students complete the numbering.



3. Play "Concentration" as described in the Activity Reservoir. Use

matching cards such as: $\frac{38}{100}$ - 0.38.

Perhaps the children would enjoy "Triple Concentration". Supply additional "word-name" cards (i.e., "thirty-eight hundredths") to the deck. Players must match the three cards in order to win the set.

EXTRA PRACTICE

Copy and complete the following.

(a) 0.2 The 2 is in the tenth's place and represents $\frac{2}{10}$.

(b) 0.34 The 4 is in the _____ place and represents _____.

(c) 5.6 The 6 is in the _____ place and represents _____.

(d) 0.19 The 9 is in the _____ place and represents _____.

(e) 4.81 The 8 is in the _____ place and represents _____.

OBJECTIVE

To give the place value for any digit in a decimal number involving ones, tenths, and hundredths

PACING

Level A All
Level B All
Level C All

MATERIALS

display cards as illustrated

RELATED AIDS

HMS—DM55 and DM56.

SUGGESTIONS

Initial Activity Discuss the number of tenths in one whole, the number of hundredths in one whole, and the number of hundredths in one tenth.

Students may find the relationship between dollars, dimes, and pennies useful as a reference.

Emphasize that the decimal point separates wholes from parts and goes between the one's and tenth's position.

ACTIVITIES

1. Make up envelope sets, each containing some place-value cards such as:

Envelope A. A one's card, a tenth's card showing 3 tenths, and a card showing 8 hundredths.

Envelope B. Two one's cards, a hundredth's card showing 37 hundredths.

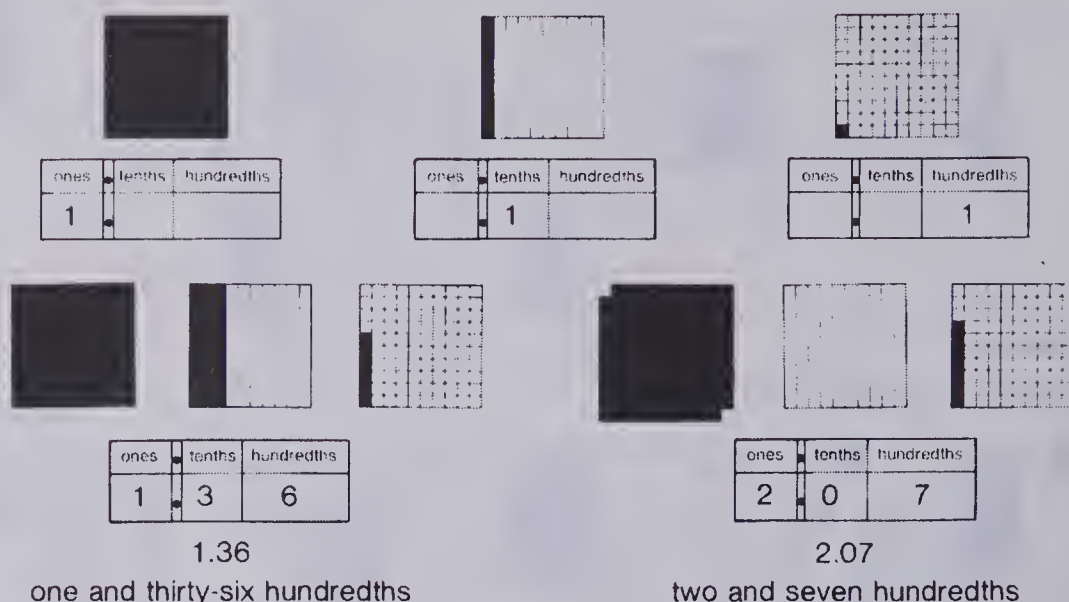
The students in turn empty each envelope and record the number represented by the cards:

A → 1.38
B → 2.37

2. Provide each pair of students with a set of one's cards, tenth's strips, and hundredth's squares (see DM55). One student sets out one or more one's cards, 0 or 1 or more tenth's strips, and 0 or 1 or more hundredth's squares. The second student writes the decimal for the number. Students change roles.

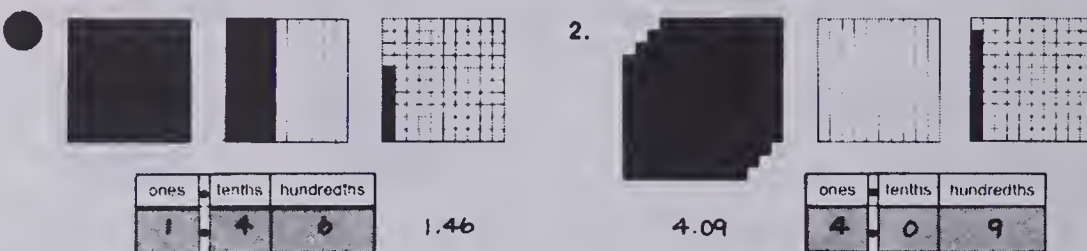
3. Have students play "The P.V. Game" as described in the Activity Reservoir. Each student requires several place-value charts showing ones, tenths, and hundredths.

Place Value



Exercises

Copy and complete each place-value chart. Write the decimal for each.

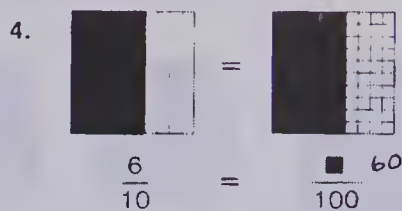
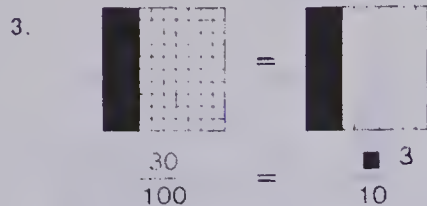


216 Place value

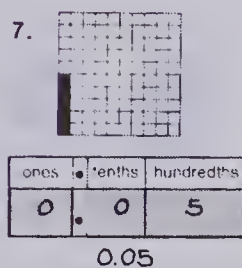
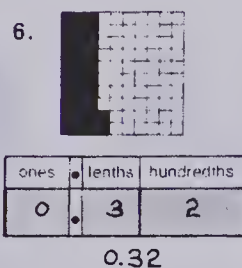
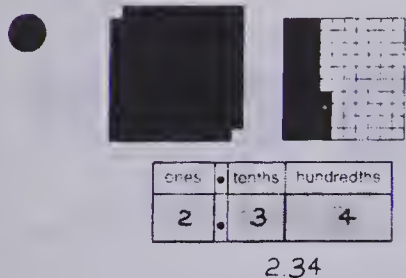
Using the Book Refer to the display to emphasize the place value of digits more than and less than one.

Assign Exercises 1-7 and check. If problems occur, reteach before assigning Exercises 8 and 9. Instead of copying the place-value chart for Exercises 1, 2, and 5-7, you may wish to provide one, as on DM55.

Use the pictures to help you complete the statements.

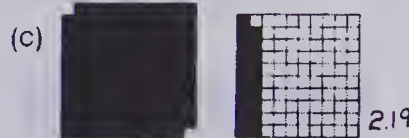


Copy and complete each place-value chart.
Write the decimal for each.



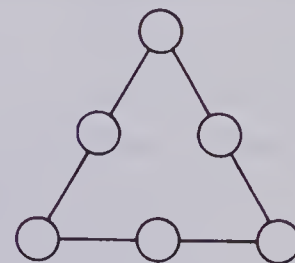
8. (a) What does the 3 mean in 0.3?
3 tenths
(b) What does the 5 mean in 0.05?
5 hundredths
(c) What does the 7 mean in 7.12?
7 ones
(d) What does the 2 mean in 1.28?
2 tenths

9. Write the decimal for each.



4. Challenge students with a problem such as:

- (a) Place the numbers 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 in the circles so the sums along the three sides are the same. Is there more than one solution?
(b) Repeat (a) using 1.2, 1.3, 1.4, 1.5, 1.6, and 1.7.
(c) Repeat (a) using any 6 consecutive numbers.



EXTRA PRACTICE

See HMS—DM56.

OBJECTIVE

To name the place value for any digit in decimal form involving tenths and hundredths

PACING

Level A All
 Level B All
 Level C All

RELATED AIDS

HMS—DM55 and DM56.

BACKGROUND

Decimal numbers can be read as “thirteen decimal four nine” or “thirteen and forty-nine hundredths”. The second method emphasizes the fact that the four tenths and the nine hundredths together are forty-nine hundredths.

SUGGESTIONS

Initial Activity Have the students read several decimal numbers using the second method. Point out that the place of the last digit tells the decimal value of the number, e.g., 10.23, the three is in the hundredth’s place.

ACTIVITIES

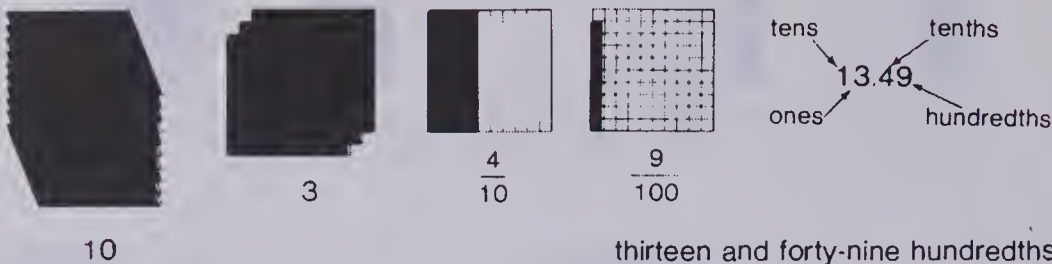
1. If they have not already done so, the children may enjoy completing the activities as described for pages 216 and 217.

2. Prepare (the children can help!) a deck of 50 cards in order to play “I’m the Greatest!”. The deck consists of 5 sets of cards, each numbered from 0-9 in five different colours. Each player (2-6) should also be provided with a set of place-value headings cards (i.e., tens, ones, decimal, tenths, hundredths). Colour these heading cards in colours which match the cards from the deck (i.e., tens—red, ones—blue, etc.). Players display their heading cards in front of them. Deal 4 cards per player. Players take turns exchanging a card in hand for the top card from either the deck (face down) or the second pile (face up). First player to be able to lay down a correctly coloured 4-digit number (i.e., 47.32) is the winner of that hand and scores 1 point. First player to score 5 points is the overall winner.

EXTRA PRACTICE

1. In the number 36.49,
 what does the 3 mean?
 what does the 6 mean?
 what does the 4 mean?
 what does the 9 mean?

Meaning of Numbers



Exercises

Give the value of each.

1.
 12 and 36 hundredths
2.
 24 and 9 hundredths
3. In the number 21.53,
 what does the 2 mean? 2 tens
 what does the 1 mean? 1 one
 what does the 5 mean? 5 tenths
 what does the 3 mean? 3 hundredths
4. In the number 56.07,
 how many in the ten's position? 5
 the one's position? 6
 the tenth's position? 0
 the hundredth's position? 7

Draw a place-value chart and complete it for each number.

tens	ones	.	tenths	hundredths

5. 45.67
6. 72.03
7. 50.47
8. 98.01

218 Place value

Using the Book Note in the display that one whole number is represented by one whole card. Point out that the number in the display is represented four ways: (1) picture, (2) whole numbers and fractions, (3) standard form (i.e., 13.49) and (4) words. Be sure to emphasize the connection between these, explaining how the standard form was arrived at.

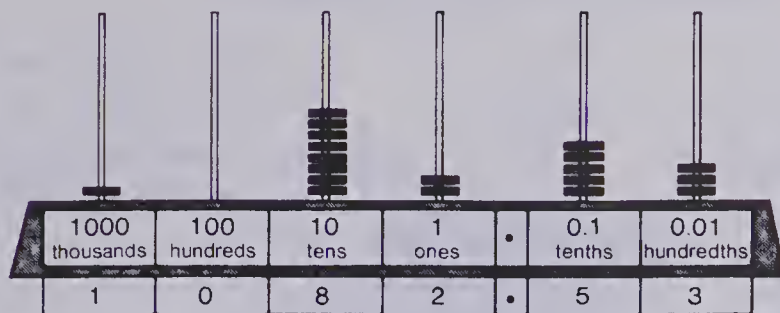
Assign the exercises. Be sure that the children are familiar with how to record their answers. For Exercises 5-8, you may wish to provide a place-value chart from DM55.

ANSWERS

	tens	ones	.	tenths	hundredths
5.	4	5	.	6	7
6.	7	2	.	0	3
7.	5	0	.	4	7
8.	9	8	.	0	1

2. In the number 47.08,
 how many in the ten's position?
 the one's position?
 the tenth's position?
 the hundredth's position?
3. If you have not already done so, see DM56.

Place Value

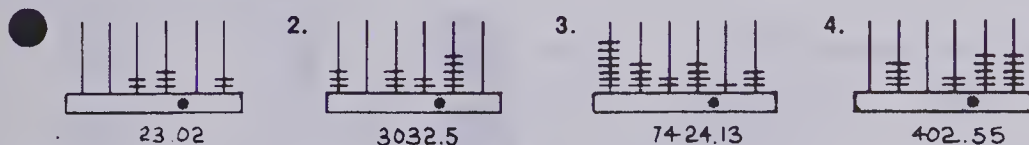


one thousand, eighty-two and fifty-three hundredths

The abacus can be used to show numbers.

Exercises

What numbers are represented?



Draw an abacus to show each number.

5. 324.21
6. 2058.4
7. 402.03
8. 6521.32
9. In 2304.56,
 - (a) What does the "2" mean? ^{2 thousands}
 - (b) What does the "3" mean? ^{3 hundreds}
 - (c) What does the "0" mean? ^{0 tens}
 - (d) What does the "4" mean? ^{4 ones}
 - (e) What does the "5" mean? ^{5 tenths}
 - (f) What does the "6" mean? ^{6 hundredths}
10. Write each numeral.
 - (a) nine thousand, fifty-one and six hundredths 9051.06
 - (b) two thousand, nine and fifty-two hundredths 2009.52
 - (c) eight thousand, two hundred and five tenths 8200.5

OBJECTIVE

To give place value for any digit in numbers involving hundredths to thousands

PACING

Level A All
Level B All
Level C All

VOCABULARY

abacus

MATERIALS

demonstration abacus or small abacuses for group work

SUGGESTIONS

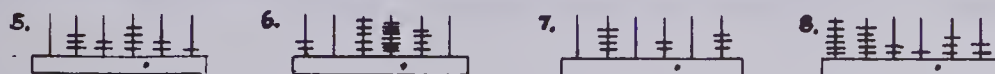
Initial Activity Familiarize students with the abacus and its function. Point out the relationship between an abacus and written place-value charts. Use a brightly coloured circle taped to the front of the abacus to represent the decimal point.

Ask a student to represent on the abacus a decimal number that you give orally (such as 465.07). Ask another student to tell what each digit means. Emphasize that "zero" in place value means "no tens", "no ones", etc.

Place value 219

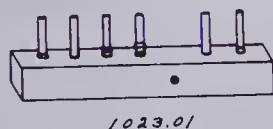
Using the Book Work together on Exercises 1 and 2, then assign the rest of the page as individual seatwork.

ANSWERS



ACTIVITIES

1. Have groups of students make their own abacus using a piece of styrofoam, pipe cleaners, and beads.



One student puts beads on the abacus. The other student writes the number represented on the abacus.

2. Using an abacus (or the one made in Activity 1) children might enjoy playing "Behind My 'BACUS'!". Divide children into twos (or two teams). First player demonstrates a number (i.e., 3056.12) using the abacus (and preferably, 6 different digits). The abacus is then covered up or concealed by a partition till later in the game. Second player may ask questions in an

attempt to guess the number shown on the hidden abacus (i.e., Question: "Are there any sixes?" Answer: "Yes—in the one's place."). Second player keeps a record on a blank abacus as pictured on this page (i.e.,).

Second player continues asking questions until either (a) he/she receives two "No" answers (b) he/she has asked 10 questions (first player should keep count). Second player must then try to guess what number was displayed "behind their Bacus". Players (or teams) then reverse roles.

EXTRA PRACTICE

Extension:

Use the expanded form to show place value.

1. $246.3 = (2 \times 100) + (4 \times 10) + (6 \times 1) + (3 \times \frac{1}{10})$
2. 1057.2 3. 205.7 4. 48.63

5. 6723.41 6. 350.6 7. 7042.05

What numbers are represented?

$$8. (2 \times 1000) + (3 \times 100) + (8 \times 10) + (0 \times 1) + (6 \times \frac{1}{10}) + (7 \times \frac{1}{100}) = 2380.67$$

$$9. (8 \times 100) + (5 \times 10) + (7 \times 1) + (6 \times \frac{1}{10}) + (3 \times \frac{1}{100})$$

$$10. (9 \times 1000) + (4 \times 100) + (3 \times 10) + (3 \times 1) + (0 \times \frac{1}{10}) + (5 \times \frac{1}{100})$$

$$11. (7 \times 1000) + (0 \times 100) + (6 \times 10) + (5 \times 1) + (7 \times \frac{1}{10}) + (7 \times \frac{1}{100})$$

$$12. (6 \times 10) + (8 \times 1) + (0 \times \frac{1}{10}) + (7 \times \frac{1}{100})$$

$$13. (4 \times 1000) + (6 \times 100) + (8 \times 10) + (10 \times 1) + (5 \times \frac{1}{10}) + (0 \times \frac{1}{100})$$

OBJECTIVE

To add hundredths with no regrouping

PACING

Level A All

Level B All

Level C 1-4, 7, 8

RELATED AIDS

HMS — DM55.

SUGGESTIONS

Initial Activity Review the process of addition with whole numbers noting that we add columns from right to left.

Discuss the number of tenths in one whole and the number of hundredths in one whole and in one tenth. Use the hundredth's grid to help.

ACTIVITIES

1. For those students who find the exercises very easy, provide some questions of these types.

1. $3.47 + 1.31 = \blacksquare$ 2. $8.12 + 2.47 = \blacksquare$

3. $5.39 + 1.20 = \blacksquare$

4. $1.62 + 4.3$ 5. $11.74 + 6.05$ 6. $8.09 + 15.1$

Both types of questions may need some explanation (e.g., write in vertical form; use zero).

2. Provide questions similar to those below and ask students to find the "missing digits". (Answers to (a) and (b) are given in brackets.)

(a)
$$\begin{array}{r} 2.\blacksquare \\ + \blacksquare.1 \\ \hline 6.8 \end{array}$$
 (b)
$$\begin{array}{r} 2.1\blacksquare \\ + \blacksquare.\blacksquare5 \\ \hline 3.49 \end{array}$$

(c)
$$\begin{array}{r} 7.8\blacksquare \\ + \blacksquare.\blacksquare3 \\ \hline 8.98 \end{array}$$
 (d)
$$\begin{array}{r} \blacksquare3.\blacksquare\blacksquare \\ + 2\blacksquare.06 \\ \hline 35.06 \end{array}$$

3. Copy the puzzle on the chalkboard (or duplicate) and have the students complete it. Errors can be easily determined if the puzzle does not "work out" correctly. (Answers are given in brackets.)

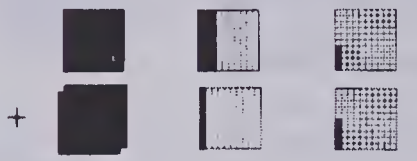
a	b	c	
(3).→	(5).↓	(8)	
	d	(5).↓	e
	(9).→	(4).↓	
f		g	
(8).↓		(7).→	(7)
h			
(6).→	(3)	(4)	

Adding Hundredths

Add.

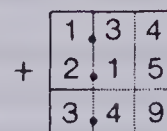
$$\begin{array}{r} 1.34 \\ + 2.15 \\ \hline \end{array}$$

9 Add hundredths.



$$\begin{array}{r} 1.34 \\ + 2.15 \\ \hline \end{array}$$

.49 Add tenths.



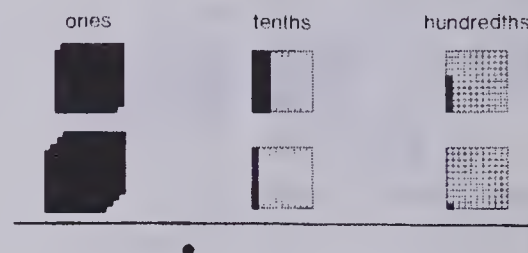
$$\begin{array}{r} 1.34 \\ + 2.15 \\ \hline \end{array}$$

3.49 Add ones.

Exercises

Add. Use the blocks to help.

1.
$$\begin{array}{r} 2.36 \\ + 4.11 \\ \hline 6.47 \end{array}$$



Add. Use the place-value chart.

2.
$$\begin{array}{r} 1.43 \\ + 5.26 \\ \hline 6.69 \end{array}$$

ones	tenths	hundredths
1	4	3
5	2	6
6	6	9

3.
$$\begin{array}{r} 4.12 \\ + 3.15 \\ \hline 7.27 \end{array}$$

ones	tenths	hundredths
4	1	2
3	1	5
7	2	7

4.
$$\begin{array}{r} 6.12 \\ + 1.87 \\ \hline 7.99 \end{array}$$

5.
$$\begin{array}{r} 7.23 \\ + 2.71 \\ \hline 9.94 \end{array}$$

6.
$$\begin{array}{r} 8.41 \\ + 1.38 \\ \hline 9.79 \end{array}$$

7.
$$\begin{array}{r} 53.23 \\ + 21.45 \\ \hline 74.68 \end{array}$$

8.
$$\begin{array}{r} 28.76 \\ + 31.23 \\ \hline 59.99 \end{array}$$

220 Adding hundredths, no regrouping

Using the Book Emphasize that the decimals are to be lined up before adding. Start adding with the hundredths first, then tenths, then ones, etc.

Work out several examples with students, then assign the exercises. If using the place-value charts as indicated with Exercises 2 and 3, you may also wish to distribute "working" place-value charts as shown on DM55.

ACROSS

- a $1.02 + 2.56$
d $5.12 + 4.42$
g $3.3 + 4.4$
h $2.1 + 4.24$

DOWN

- b $2.6 + 3.3$
c $42.21 + 43.53$
e $3.2 + 1.5$
f $5.0 + 3.6$

You may wish to explain that the decimal points have already been added. The small arrows indicate the number to which the decimal point refers.

Adding Decimals

1 large pumpkin: 11.68 kg
1 large turnip: 3.14 kg

$$\begin{array}{r} 11.68 \\ + 3.14 \\ \hline \end{array}$$

1	1	6	8
	3	1	4
1	4	8	2

+

How many kilograms altogether?
The two are 14.82 kg.

$$\begin{array}{r} 11.68 \\ + 3.14 \\ \hline 14.82 \end{array}$$

12 hundredths
is 1 tenth and
2 hundredths.



Exercises

Add. Use the place-value chart.

$$\begin{array}{r} 1. \quad 3.26 \\ + 4.18 \\ \hline 7.44 \end{array}$$

3	2	6
4	1	8
7	4	4

$$\begin{array}{r} 2. \quad 4.67 \\ + 2.65 \\ \hline 7.32 \end{array}$$

4	6	7
2	6	5
7	3	2

$$\begin{array}{r} \bullet \quad 2.31 \\ + 7.24 \\ \hline 9.55 \end{array}$$

$$\begin{array}{r} \bullet \quad 3.41 \\ + 2.18 \\ \hline 5.59 \end{array}$$

$$\begin{array}{r} 5. \quad 5.16 \\ + 1.73 \\ \hline 6.89 \end{array}$$

$$\begin{array}{r} 6. \quad 6.23 \\ + 1.45 \\ \hline 7.68 \end{array}$$

$$\begin{array}{r} 7. \quad 5.36 \\ + 4.48 \\ \hline 9.84 \end{array}$$

$$\begin{array}{r} \bullet \quad 16.74 \\ + 1.63 \\ \hline 18.37 \end{array}$$

$$\begin{array}{r} 9. \quad 11.49 \\ + 4.89 \\ \hline 16.38 \end{array}$$

$$\begin{array}{r} 10. \quad 14.67 \\ + 11.78 \\ \hline 26.45 \end{array}$$

$$\begin{array}{r} 11. \quad 213.23 \\ + 22.98 \\ \hline 236.21 \end{array}$$

$$\begin{array}{r} 12. \quad 332.94 \\ + 413.98 \\ \hline 746.92 \end{array}$$

13. A salmon derby.

Fred's salmon: 21.31 kg

Ron's salmon: 19.45 kg

How much altogether? 40.76 kg

14. Machinist at work.

Length of first steel pipe: 3.52 m

Length of second steel pipe: 2.88 m

How much altogether? 6.40 m

Adding decimals, regrouping 221

OBJECTIVE

To add decimals (hundredths) with regrouping

PACING

Level A 1-10, 13, 14

Level B All

Level C 1, 3, 4, 8-14

VOCABULARY

salmon, machinist

RELATED AIDS

CALC. W/BK — 21, 22.

SUGGESTIONS

Initial Activity Review the process of addition with whole numbers with regrouping. Emphasize that ten ones are the same as one ten.

Using the hundredth's grid or suitably-sized strips, elicit from the students that 12 hundredths is equal to 1 tenth and 2 hundredths. Repeat for other regrouping situations such as 14 hundredths, 16 hundredths.

Using the Book Emphasize that decimals are to be lined up before beginning addition. You may wish to provide students with half centimetre graph paper to help students line up the numbers properly or, if using the place-value charts as suggested, provide "working" place-value charts as shown on DM55.

ACTIVITIES

1. Use the set of place-value cards in Activity 2, page 217. Working in pairs one student sets out cards to represent 2 numbers as in the display. The second student writes the numbers, then adds. Each checks by counting. Students then change roles.

2. Use the abacus each group made in Activity 1, page 219. Student A writes 2 numbers, each less than 1000, ready for adding. Student B places the beads on the abacus to represent the numbers. Then regrouping is carried out to show the final number. Check by adding, comparing. Students change roles.

3. Have students write word problems involving addition of decimal numbers. Provide cards for the problems. On the reverse side, the student writes the solution in the appropriate form concluding with a word sentence. These cards can be put on the bulletin board. If this is among one of the first times in which students have been required to write word problems, they may benefit from having a framework around which to create their problems.

Example

"David _____ \$3.16 _____.

Sharlene _____ \$5.87 _____.

How much _____ ?"

or

"Use these words and numbers to write a word problem:
sand, 14.67, 12.50, kilograms, patio."

EXTRA PRACTICE

$$\begin{array}{r} 1. \quad 1417.03 \\ + 1964.89 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 2347.63 \\ + 2111.36 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 110.43 \\ + 789.34 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 916.93 \\ + 917.28 \\ \hline \end{array}$$

$$5. \quad 3.41 + 2.54 = \blacksquare$$

$$6. \quad 14.68 + 10.44 = \blacksquare$$

$$7. \quad 123.29 + 67.82 = \blacksquare$$

$$8. \quad 8.24 + 12.73 = \blacksquare$$

$$9. \quad 24.51 + 137.93 = \blacksquare$$

$$10. \quad 101.01 + 120.26 = \blacksquare$$

OBJECTIVE

To subtract hundredths with no regrouping

PACING

Level A All
Level B All
Level C 1, 2, 4-8

SUGGESTIONS

Initial Activity Review the process of subtraction with whole numbers noting that we subtract the columns working from right to left. Complete several examples without regrouping, before moving on to the textbook page.

Example

$$\begin{array}{r} 1. \quad 4.86 \\ - 2.72 \\ \hline \end{array} \quad \begin{array}{r} 2. \quad 8.25 \\ - 3.14 \\ \hline \end{array} \quad \begin{array}{r} 3. \quad 7.93 - 4.71 \\ \hline \end{array}$$

ACTIVITIES

1. For those students who find the exercise very easy, provide some questions of these types.

$$\begin{array}{l} 1. \quad 7.36 - 5.23 = \blacksquare \\ 3. \quad 4.79 - 3.65 = \blacksquare \end{array} \quad \begin{array}{l} 2. \quad 9.44 - 6.11 = \blacksquare \end{array}$$

$$\begin{array}{r} 4. \quad 4.29 \\ - 1.16 \\ \hline \end{array} \quad \begin{array}{r} 5. \quad 74.89 \\ - 3.07 \\ \hline \end{array} \quad \begin{array}{r} 6. \quad 8.56 \\ - 3.4 \\ \hline \end{array}$$

2. Provide a challenge such as: "Find the Missing Digits."

$$\begin{array}{l} (a) \quad \begin{array}{r} 7.5\blacksquare \\ - \blacksquare.\blacksquare1 \\ \hline 5.12 \end{array} \quad \left(\begin{array}{r} 7.53 \\ - 2.41 \\ \hline 5.12 \end{array} \right) \quad (b) \quad \begin{array}{r} 5.\blacksquare8 \\ - \blacksquare.1\blacksquare \\ \hline 4.04 \end{array} \quad \left(\begin{array}{r} 5.18 \\ - 1.14 \\ \hline 4.04 \end{array} \right) \\ (c) \quad \begin{array}{r} \blacksquare.9\blacksquare \\ - 3.\blacksquare4 \\ \hline 0.72 \end{array} \quad \left(\begin{array}{r} 3.96 \\ - 3.24 \\ \hline 0.72 \end{array} \right) \end{array}$$

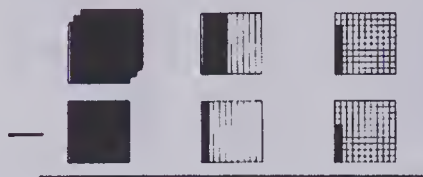
Children might enjoy checking for accuracy with a calculator if one is available.

3. See "Picking Peaches" in the Activity Reservoir. Provide deck cards (the children can help!) which show subtraction of hundredths without regrouping.

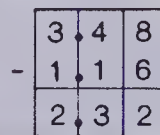
Subtracting Hundredths

Subtract.

$$\begin{array}{r} 3.48 \\ - 1.16 \\ \hline 2.32 \end{array}$$



$$\begin{array}{r} 3.48 \\ - 1.16 \\ \hline .32 \end{array}$$

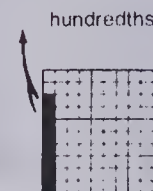


$$\begin{array}{r} 3.48 \\ - 1.16 \\ \hline 2.32 \end{array}$$

Exercises

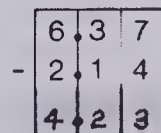
Subtract. Use the blocks to help you.

$$\begin{array}{r} 1. \quad 4.68 \\ - 2.32 \\ \hline 2.36 \end{array}$$

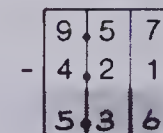


Subtract. Use the place-value chart.

$$\begin{array}{r} 2. \quad 6.37 \\ - 2.14 \\ \hline 4.23 \end{array}$$



$$\begin{array}{r} 3. \quad 9.57 \\ - 4.21 \\ \hline 5.36 \end{array}$$



$$\begin{array}{r} \bullet \quad 6.43 \\ - 2.11 \\ \hline 4.32 \end{array}$$

$$\begin{array}{r} \bullet \quad 5.48 \\ - 2.18 \\ \hline 3.30 \end{array}$$

$$\begin{array}{r} 6. \quad 6.68 \\ - 1.48 \\ \hline 5.20 \end{array}$$

$$\begin{array}{r} 7. \quad 39.84 \\ - 15.44 \\ \hline 24.40 \end{array}$$

$$\begin{array}{r} 8. \quad 49.93 \\ - 14.62 \\ \hline 35.31 \end{array}$$

222 Subtracting hundredths, no regrouping

Using the Book Emphasize that the decimals are to be lined up before beginning subtraction. Subtract hundredths first, then tenths, then ones, etc.

Work out several examples with students, then assign the exercises. The place-value charts suggested for use with the exercises can be found on DM55.

Subtracting Decimals

Tom's puppy: 3.18 kg
One year later: 14.62 kg
How much did it grow
in one year?



The puppy gained 11.44 kg.

Subtract.

$$\begin{array}{r} 14.62 \\ - 3.18 \\ \hline 11.44 \end{array}$$

		5	12
1	4	6	2
	3	1	8
1	1	4	4

Regroup 1 tenth.
We have
12 hundredths now.

Exercises

Subtract. Use the place-value chart.

1.
$$\begin{array}{r} 5.63 \\ - 2.17 \\ \hline 3.46 \end{array}$$

5	6	3
2	1	7
3	4	6

2.
$$\begin{array}{r} 16.21 \\ - 3.19 \\ \hline 13.02 \end{array}$$

1	6	2	1
	3	1	9
1	3	0	2

3.
$$\begin{array}{r} 6.34 \\ - 2.19 \\ \hline 4.15 \end{array}$$

4.
$$\begin{array}{r} 8.54 \\ - 3.18 \\ \hline 5.36 \end{array}$$

5.
$$\begin{array}{r} 6.08 \\ - 1.82 \\ \hline 4.26 \end{array}$$

6.
$$\begin{array}{r} 9.74 \\ - 1.98 \\ \hline 7.76 \end{array}$$

7.
$$\begin{array}{r} 8.05 \\ - 3.98 \\ \hline 4.07 \end{array}$$

8.
$$\begin{array}{r} 73.08 \\ - 8.91 \\ \hline 64.17 \end{array}$$

9.
$$\begin{array}{r} 24.31 \\ - 13.18 \\ \hline 11.13 \end{array}$$

10.
$$\begin{array}{r} 13.11 \\ - 1.18 \\ \hline 11.93 \end{array}$$

11.
$$\begin{array}{r} 414.02 \\ - 21.18 \\ \hline 392.84 \end{array}$$

12.
$$\begin{array}{r} 342.11 \\ - 152.28 \\ \hline 189.83 \end{array}$$

13. Salmon Derby.

Rhoda's salmon: 21.31 kg

Debbie's salmon: 19.45 kg

What is the difference in kilograms? 1.86 kg

14. Machinist at work.

Length of steel: 2.88 m

Length needed: 3.52 m

How much more is needed? 0.64 m

OBJECTIVE

To subtract decimals with regrouping

PACING

Level A 1-5, 8-14

Level B All

Level C 1, 3, 4, 8-14

RELATED AIDS

HMS—DM57.

CALC. W/BK — 23, 24.

SUGGESTIONS

Initial Activity Review the process of subtraction with whole numbers requiring regrouping. Emphasize that one ten and ten ones are the same.

Use the hundredth's grid to help students visualize another way of writing 1 tenth and 4 hundredths as 14 hundredths. Repeat for other examples if necessary.

Subtracting decimals, regrouping 223

Using the Book Emphasize that decimals are to be lined up before beginning subtraction. You may provide graph paper to those who have difficulty. The place-value charts suggested for use with the exercises can be found on DM57.

ACTIVITIES

1. Use the sets of place-value cards in Activity 2, page 217. Student A sets out cards to represent a number. Student B writes the number and under it writes a smaller number and performs the subtraction. Student A is to show the answer using the place-value cards.

2. Use the abacus made in Activity 1, page 219. Student A writes a subtraction question. Student B is to put the beads on the abacus, then "take away" the number necessary to show the answer. Check by calculating.

3. Have students prepare on cards, word problems involving subtraction of decimals. Full solutions in proper form

are to be placed on the reverse side of each card. If children have not previously had practice writing their own word problems, provide a framework as outlined in Activity 3, page 221.

EXTRA PRACTICE

Subtract.

1. (a)
$$\begin{array}{r} 2374.61 \\ - 946.71 \\ \hline \end{array}$$

(b)
$$\begin{array}{r} 1603.00 \\ - 1161.14 \\ \hline \end{array}$$

(c)
$$\begin{array}{r} 868.34 \\ - 456.29 \\ \hline \end{array}$$

(d)
$$\begin{array}{r} 123.00 \\ - 106.89 \\ \hline \end{array}$$

2. (a) $17.23 - 15.36 = \blacksquare$

(b) $99.51 - 76.44 = \blacksquare$

(c) $123.86 - 78.69 = \blacksquare$

3. (a) $10.04 - 8.29 = \blacksquare$
(b) $101.06 - 73.57 = \blacksquare$
(c) $80.00 - 29.99 = \blacksquare$

4. A Tall Tale.
Giant's height: 3.12 m
Son's height: 2.53 m
What is the difference in metres?

5. Big Feet.
Uncle Jeff: 52.56 cm
Wee Willie: 28.79 cm
What is the difference in centimetres?

6. A Full Cup.
Regular: 250.5 mL
Small: 164.25 mL
How many millilitres larger?
See DM57 for more Extra Practice.

OBJECTIVE

To add and subtract numbers involving whole numbers and decimals from thousands to hundredths

PACING

Level A 1-10, 16, 17

Level B All

Level C 1-3, 6-8, 11-17

RELATED AIDS

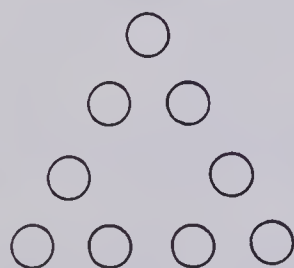
HMS—DM57.

SUGGESTIONS

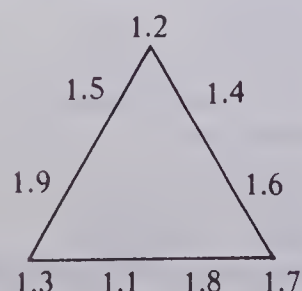
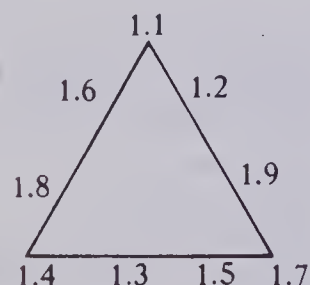
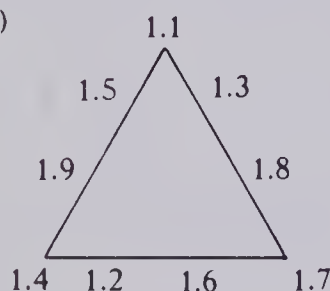
Initial Activity Remind students and illustrate that after the decimal points have been lined up, adding and subtracting decimals is like adding and subtracting whole numbers.

ACTIVITIES

1. Write in circles the numbers: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9. Arrange the circles with numbers on this pattern so that the sum of the vertices is 4.2 and the sum of a side is 5.9. There are four different solutions.



(Answers)



$$\begin{array}{r} \text{Add.} \\ \begin{array}{r} 49.65 \\ + 13.49 \\ \hline 63.14 \end{array} \end{array}$$

$$\begin{array}{r} \text{Subtract.} \\ \begin{array}{r} 67.84 \\ - 49.98 \\ \hline 17.86 \end{array} \end{array}$$

Adding and subtracting decimals is like adding and subtracting whole numbers.

Exercises

Add. Line up the decimals.

1. $\begin{array}{r} 45.67 \\ + 56.21 \\ \hline 101.88 \end{array}$	2. $\begin{array}{r} 6.07 \\ + 11.25 \\ \hline 17.32 \end{array}$	3. $\begin{array}{r} 40.28 \\ + 45.61 \\ \hline 85.89 \end{array}$	4. $\begin{array}{r} 45.67 \\ + 1.58 \\ \hline 47.25 \end{array}$	5. $\begin{array}{r} 19.23 \\ + 91.87 \\ \hline 111.10 \end{array}$
---	---	--	---	---

Subtract. Line up the decimals.

6. $\begin{array}{r} 35.89 \\ - 14.26 \\ \hline 21.63 \end{array}$	7. $\begin{array}{r} 24.75 \\ - 21.63 \\ \hline 3.12 \end{array}$	8. $\begin{array}{r} 94.47 \\ - 31.46 \\ \hline 63.01 \end{array}$	9. $\begin{array}{r} 92.86 \\ - 8.79 \\ \hline 84.07 \end{array}$	10. $\begin{array}{r} 99.56 \\ - 95.83 \\ \hline 3.73 \end{array}$
--	---	--	---	--

Add or subtract.

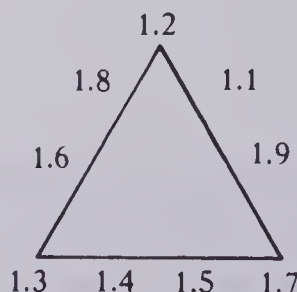
11. $\begin{array}{r} 132.93 \\ + 64.21 \\ \hline 197.14 \end{array}$	12. $\begin{array}{r} 2345.67 \\ + 41.08 \\ \hline 2386.75 \end{array}$	13. $\begin{array}{r} 8.09 \\ + 1141.83 \\ \hline 1149.92 \end{array}$	14. $\begin{array}{r} 1785.09 \\ - 96.94 \\ \hline 1688.15 \end{array}$	15. $\begin{array}{r} 1876.00 \\ - 78.92 \\ \hline 1797.08 \end{array}$
---	---	--	---	---

- | | |
|---|---|
| 16. The mass of a farm truck is 1345.5 kg.
The mass of the wheat in the truck is 814.6 kg.
What is the total mass? <u>2160.1 kg</u> | 17. The mass of the truck and wheat is 2946.7 kg.
The mass of the truck is 1564.9 kg.
What is the mass of the wheat? <u>1381.8 kg</u> |
|---|---|

224 Addition and subtraction

Using the Book Read through the display at the top of the page, clarifying any points if necessary. You may wish to have someone complete the computations for $49.65 + 13.49 = 63.14$ and $67.84 - 49.98 = 17.86$, to demonstrate the point being made in the red box.

Assign the exercises.



2. See the Fact-Folder idea in the Activity Reservoir.

EXTRA PRACTICE

Add.

1. $\begin{array}{r} 543.76 \\ + 165.12 \\ \hline \end{array}$	2. $\begin{array}{r} 56.87 \\ + 92.51 \\ \hline \end{array}$
3. $\begin{array}{r} 340.72 \\ + 145.16 \\ \hline \end{array}$	4. $\begin{array}{r} 47.47 \\ + 28.28 \\ \hline \end{array}$

Subtract.

1. $\begin{array}{r} 231.39 \\ - 46.54 \\ \hline \end{array}$	2. $\begin{array}{r} 200.02 \\ - 72.17 \\ \hline \end{array}$
3. $\begin{array}{r} 40.76 \\ - 31.88 \\ \hline \end{array}$	4. $\begin{array}{r} 300.00 \\ - 173.42 \\ \hline \end{array}$

Find the sum.

1. $\begin{array}{r} \$246.02 \\ + 619.74 \\ \hline \end{array}$	2. $\begin{array}{r} \$906.00 \\ + 845.00 \\ \hline \end{array}$
3. $\begin{array}{r} \$58.33 \\ + 60.70 \\ \hline \end{array}$	4. $\begin{array}{r} \$729.14 \\ + 53.00 \\ \hline \end{array}$

Find the difference.

1. $\begin{array}{r} \$80.50 \\ - 34.03 \\ \hline \end{array}$	2. $\begin{array}{r} \$796.88 \\ - 200.09 \\ \hline \end{array}$
3. $\begin{array}{r} \$40.00 \\ - 26.55 \\ \hline \end{array}$	4. $\begin{array}{r} \$577.40 \\ - 96.89 \\ \hline \end{array}$

For more Extra Practice, see DM57.

Let's Compare

\$124.08 ● \$124.53

1 hundred	2 tens	4 ones	and	no dimes	8 pennies
↙ same ↘	↙ same ↘	↙ same ↘		↙ less ↘	
1 hundred	2 tens	4 ones	and	5 dimes	3 pennies

\$124.08 < \$124.53

Exercises

Compare. Use >, <, or =.

1. \$26.37 and \$26.34

2	6	.	3	7
↑	↑		↑	↑
2	6	.	3	4

\$26.37 ● \$26.34

2. \$3529.75 and \$3541.05

3	5	2	9	.	7	5
↑	↑	↑	↑		↑	↑
3	5	4	1	.	0	5

\$3529.75 ● \$3541.05

● \$0.54 ● \$0.25 > ● \$0.86 ● \$0.94 < ● \$0.44 ● \$0.44 =

6. \$3.29 ● \$3.49 < 7. \$4.41 ● \$4.46 < 8. \$23.14 ● \$22.06 >

9. 24.50 ● 24.30 > 10. 19.25 ● 18.50 > 11. 38.60 ● 58.60 <

12. Long Jump.

Michael: 3.62 m

Patrick: 3.47 m

Who jumped farther?

Michael

13. Portable Radios

The "Phonic": \$48.59

The "Delta": \$48.90

Which costs more?

The "Delta"

14. Racing Times.

Kathleen: 87.2 s

Sandy: 85.9 s

Who has shorter

time? Sandy

Comparing decimals 225

Using the Book Review briefly the method for comparing numbers as illustrated in the display. Remind the students that we are comparing the first number (i.e., \$124.08) with the second (i.e., \$124.53) to determine which is greater, and that the comparison is made from left to right.

Work together with the group to complete Exercises 1 and 2. Students may find the vertical format used in Exercises 1 and 2 helpful for the next few exercises. However, encourage students to compare some of the decimals using a horizontal format.

OBJECTIVE

To compare decimals (hundredths to hundreds)

PACING

Level A 1-8, 12-14

Level B All

Level C 1, 3, 4, 8-14

VOCABULARY

portable

BACKGROUND

All of the numbers being compared on this page have an equal number of digits.

SUGGESTIONS

Initial Activity Review the symbols > and < and the easy method for remembering the meaning of each (i.e., "Alvin the Alligator goes for the big ones" as outlined on page 35).

ACTIVITIES

Prepare 2 decks (about 60) of cards as

3321.51

3120.63

shown and a symbol card showing ">". Note that all cards in the deck should have the same number of digits. Shuffle the deck and divide it, giving half to each player. Players simultaneously drop a card face up on the table and take turns arranging the symbol card to make a true statement, i.e., 3321.51 > 3120.63. Player with the most pairs wins the round.

EXTRA PRACTICE

Compare. Use >, <, or =.

- \$0.37 ● \$0.36
- \$0.98 ● \$0.89
- \$5.55 ● \$5.55
- \$14.37 ● \$14.73
- 26.26 ● 26.26
- 0.01 ● 0.10
- 337.10 ● 337.70
- 49.90 ● 49.09
- 8446.73 ● 6448.96
- \$6338.22 ● \$6338.22
- 7125.41 ● 7125.50

OBJECTIVE

To compare decimals (various place values)

PACING

- Level A 1-15
- Level B All
- Level C 1-3, 10-21

BACKGROUND

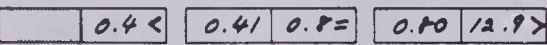
This page continues where page 225 left off. Comparisons on this page involve numbers with a different number of digits. Emphasize that lining up the decimals be done first to avoid mistakes such as $9.1 > 10.1$ because $9 > 1$.

SUGGESTIONS

Initial Activity Review number comparisons as presented in the previous lesson emphasizing that we work from left to right while making the comparisons. Then, introduce 2 numbers with a different number of digits, i.e., 21, 6; 9.1, 10.1; etc. and point out the necessity of being sure we are comparing like place-value locations, i.e., tens to tens, ones to ones, tenths to tenths, etc. Be sure to include an example such as 9, 0.9 pointing out that just as $1 = 1.0$, $9 = 9.000$, etc.

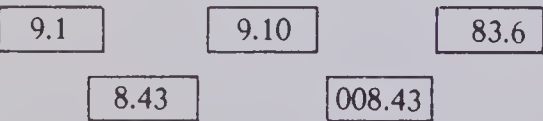
ACTIVITIES

1. See the activity on page 225. Simply replace some of the cards so that there are comparisons involving different numbers of digits.
2. Students may enjoy playing "Decimal Dominoes". Cut out of cardboard several rectangles the size of regular dominoes. Mark the dominoes with felt-tipped pens.



Have children lay out the cardboard dominoes so that true statements are made.

3. For those students who have difficulty annexing zeroes, play "Concentration" as described in the Activity Reservoir. Use cards such as:

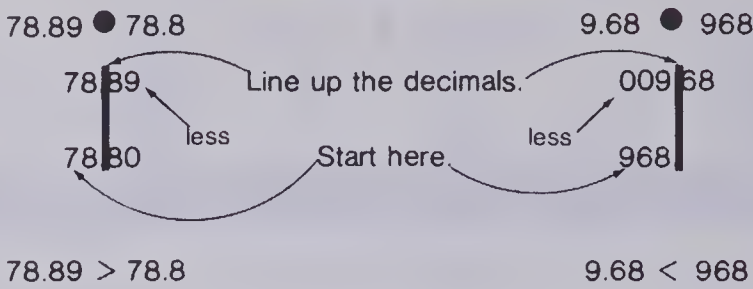


EXTRA PRACTICE

Compare. Use =, < , or > .

- | | |
|-------------------|----------------------|
| 1. 16.2 ● 16.23 | 2. 16.1 ● 16.05 |
| 3. 561.08 ● 561.2 | 4. \$27.08 ● \$27.80 |
| 5. 200.02 ● 200.1 | 6. 8099.9 ● 8100.1 |

More Comparing



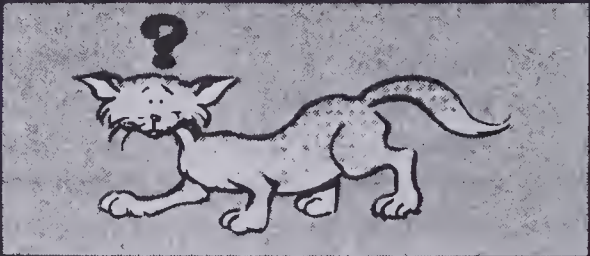
Exercises

Compare. Use > , =, or < .

- | | | |
|-----------------------|-------------------------|-----------------------|
| 1. 2.61 ● 26.1 < | 2. 34.6 ● 3.46 > | 3. 34.44 ● 34.44 = |
| 4. 561 ● 56.1 > | 5. 72.1 ● 721 < | 6. 8.4 ● 84 < |
| 7. 2.2 ● 2.28 < | 8. 31.88 ● 31.8 > | 9. 78.3 ● 78.33 < |
| 10. 185.5 ● 185.5 = | 11. 6.28 ● 62.8 < | 12. 0.8 ● 0.81 < |
| 13. 1.8 ● 2.1 < | 14. 6352.25 ● 6352.15 > | 15. 24.5 ● 54.2 < |
| 16. 627.3 ● 62.73 > | 17. 7.3 ● 7.38 < | 18. 146.75 ● 146.75 = |
| 19. 3458.7 ● 34 587 < | 20. 9000.7 ● 10 000 < | 21. 111.1 ● 11.11 > |

BRAINTICKLER

A yellow cat before two yellow cats.
A yellow cat between two yellow cats.
A yellow cat behind two yellow cats.
How many yellow cats? 3



226 Comparing decimals

Using the Book Discuss the display. Point out that in the first example (i.e., 78.89, 78.8), that once the decimal points have been lined up, a zero was added to 78.8 so that there is a number in the hundredth's place for comparison. Stress that this annexation of a zero has not changed the value of 78.8 because $78.8 = 78.80$. Note that the 3 first digits compared are the same, but because the zero in the hundredth's place of 78.80 is less than 9 in the hundredth's place of 78.89, that $78.89 > 78.8$. Repeat for 9.68, 968 stressing that $9.68 = 009.68$.

Complete Exercises 1, 2, and 3 orally. Have the children copy and complete the rest.

Something's Missing

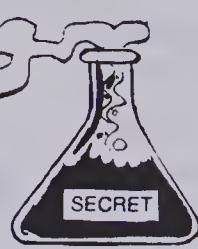
Dr. Morrow is making some secret formula.

She made 5 L on Monday.

She made some more on Tuesday.

Now she has 12 L altogether.

How many litres were made on Tuesday?



Think:

$$\begin{array}{r} 5 \\ 5 + \blacksquare \\ 5 + \blacksquare = 12 \end{array}$$

Find the missing addend by subtracting.

$$\begin{array}{r} 12 \\ - 5 \\ \hline 7 \end{array}$$

$$5 + 7 = 12$$

$\frac{7}{\blacksquare}$ L were made on Tuesday.

Exercises

Subtract to find the missing addends.

$$\begin{array}{l} 1. \quad 8 + \blacksquare = 21 \quad \begin{array}{r} 21 \\ - 8 \\ \hline \blacksquare \end{array} \quad 2. \quad \blacksquare + 14 = 22 \quad \begin{array}{r} 22 \\ - 14 \\ \hline \blacksquare \end{array} \quad 3. \quad 4.6 + \blacksquare = 9.3 \quad \begin{array}{r} 9.3 \\ - 4.6 \\ \hline \blacksquare \end{array} \end{array}$$

Find the missing addends.

$$\begin{array}{lll} 4. \quad 23 + \blacksquare = 52 & 5. \quad \$4.95 + \blacksquare = \$15.50 & 6. \quad \blacksquare + 14.2 = 19.5 \\ 7. \quad 127 + \blacksquare = 326 & 8. \quad \blacksquare + 16.35 = 28.85 & 9. \quad \blacksquare + 4.3 = 21.8 \\ 10. \quad 1240 + \blacksquare = 4357 & 11. \quad 0.81 + \blacksquare = 2.16 & 12. \quad \blacksquare + 26 = 73 \\ 13. \quad \blacksquare + 0.5 = 3.2 & 14. \quad \blacksquare + 5.35 = 16.20 & 15. \quad 0.41 + \blacksquare = 1.06 \\ 16. \quad 6.31 + \blacksquare = 9.12 & 17. \quad \blacksquare + 3.24 = 13.52 & 18. \quad \blacksquare + 42.74 = 134.23 \end{array}$$

Missing addends 227

Using the Book Work with students on Exercises 1-3 to ensure that they understand the process. Have them provide the missing addition statement that leads to $11 - 5 = \blacksquare$ (i.e., $5 + \blacksquare = 11$).

The answers for Exercises 4-6 are in the back of the book.

OBJECTIVE

To solve for a missing addend by using the inverse operation of subtraction

PACING

Level A All
Level B All
Level C All

VOCABULARY

formula

SUGGESTIONS

Initial Activity Use the theme in the display on page 227 (or one of your own choice) to develop the idea of a missing addend and how it can be found through the operation of subtraction.

You may wish to develop a "Since I know—Then I know" chart to demonstrate that we are really dealing with related facts.

Example

Since I Know	Then I Know
$4 + 8 = 12$	$12 - 8 = 4$
$8 + 4 = 12$	$12 - 4 = 8$

ACTIVITIES

1. Students might enjoy creating stories for Exercises 4-9, similar to that used in the display. You may wish to make this a whole-class activity or an individual assignment.

2. See "Deal a Number Sentence" in the Activity Reservoir.

3. Provide challenge cards such as: "Find the Missing Digits."
(Answers are given in brackets.)

- (3) (4)
(a) $2\blacksquare + \blacksquare 6 = 69$
(8) (7)
(b) $4\blacksquare + \blacksquare 5 = 123$
(8) (9)
(c) $6.\blacksquare + \blacksquare.2 = 16.0$
(7) (9)
(d) $\blacksquare.5 + 4.\blacksquare = 12.4$
(2)(4) (1)
(e) $\blacksquare\blacksquare.3 + 72.\blacksquare = 96.4$
(1)(1) (8) (3) (7)
(f) $\blacksquare\blacksquare 3.6\blacksquare + 8\blacksquare.\blacksquare 7 = 197.45$

OBJECTIVE

To write equations to solve problems
(addition and subtraction)

PACING

Level A All
Level B All
Level C All

VOCABULARY

moth, butterfly, centipede, millipede,
arrange(ment)

SUGGESTIONS

Initial Activity Review, if necessary,
Professor Q's four questions
encouraging students to answer them
mentally. Demonstrate these steps while
solving a problem relevant to the class.

Example

There are 219 boys in our school.

There are 231 girls.

How many altogether?

ACTIVITIES

1. Many people are intrigued by
records, i.e., the tallest, the shortest, the
biggest, etc. Data of this type is
nowhere more evident than in the
Guinness Book of World Records.
Your students might enjoy exploring
some of the serious and trivial records
established. A team of students could
develop questions based on records as a
challenge for other teams.

2. Children may benefit from a
"choose the correct number sentence to
fit the problem" activity to reinforce
this page which requires *writing*
appropriate number sentences. Prepare
10 single-step word problems of the
type on this page (or cut them from an
old arithmetic text). Paste them on
envelopes. Prepare matching number
sentence cards, plus several
"distractors", i.e., right number facts,
wrong order or operation. Have a child
match by placing the appropriate
solution in the correct envelope. Have a
partner check and reshuffle the cards
for the next players.

3. Provide materials so that the
Braintickler on this page can be tried
by the class.

World Records

The fastest moth can fly 55.5 km/h.

The fastest butterfly can fly 27.7 km/h.

How much faster is the moth than the
butterfly?

Step 1 Answer Professor Q's four questions.

Step 2 Write a number sentence.

Step 3 Make the sentence true.

The moth can fly 27.8 km/h faster than the butterfly.



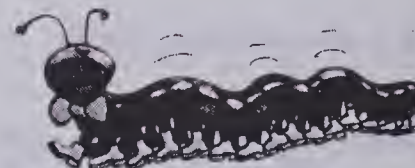
$$55.5 - 27.7 = \blacksquare$$

$$55.5 - 27.7 = 27.8$$



Exercises

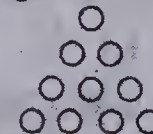
1. A centipede was found that had 354 legs.
A millipede was found that had 710 legs.
How many legs were there altogether? 1064
2. The largest spider is 25.40 cm wide.
The smallest spider is 0.05 cm wide.
What is the difference in their widths? 25.35 cm
3. The largest ant measures 3.32 cm in length.
The smallest ant measures 0.45 cm in length.
What is the difference in their lengths? 2.87 cm
4. The largest moth has a wingspan of 26.6 cm.
The largest butterfly has a wingspan of 30.4 cm.
What is the total of their wingspans? 57.0 cm



BRAINTICKLER



Arrange ten coins as shown.
Move just *three* to get
this arrangement.



228 Writing equations for problems

Using the Book Work with students on the problem in the display. You might
use this opportunity to discuss some of the superlatives used in the problems. e.g.,
largest, smallest, fastest, etc.

Who Has a Match?

Michael writes a number sentence.

$$13 + 19 = \blacksquare$$



Kathleen writes a matching story.

There are 13 boys and 19 girls in our class.
How many students are there altogether in our class?

Exercises

Number Sentence

1. $24 - 5 = \blacksquare$ 19
2. $85.3 \text{ cm} - 6.84 \text{ cm} = \blacksquare$ 78.46 cm
3. $\$2.95 + \$3.49 = \blacksquare$ \$6.44
4. $4246 + \blacksquare = 6573$ 2327
5. $\$153.99 - \$124.59 = \blacksquare$ \$29.40
6. $43.6 \text{ L} + 37.8 \text{ L} = \blacksquare$ 81.4 L
7. $137 \text{ km} + \blacksquare = 245 \text{ km}$ 108 km
8. $92 \text{ kg} - 75 \text{ kg} = \blacksquare$ 17 kg
9. $328 - 165 = \blacksquare$ 163
10. $4.3 \text{ h} + 3.9 \text{ h} = \blacksquare$ 8.2 h
11. Make each number sentence true. Write answers for your stories.

Write a matching story about:

- doughnuts
- body heights
- birthday presents
- hockey fans
- new bicycles
- gas for Mrs. Finley's car
- travelling by car
- body mass
- municipal parking lot
- weekend chores

Writing problems to fit number sentences 229

Using the Book You may wish to have students solve each equation as they work through the exercises rather than making the solution a separate objective (e.g., Exercise 11). Whatever the case, encourage students to read their answer back into the problem or story. They should ask, "Is my solution reasonable?"

OBJECTIVE

To write a word problem that matches a given open number sentence (addition and subtraction)

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

matching, doughnuts, heights, municipal parking, chores

SUGGESTIONS

Initial Activity Use the example in the display (or one of your own choice) to develop the idea of writing a problem to match a given number sentence. Much of this work could be done orally. Encourage students to provide as many different "stories" as possible for the one number sentence.

Some students may require a "theme" to get them started, e.g., marbles, apples, hockey cards, etc.

Watch carefully for student stories like this: "Bob had 13 marbles. Mary had 19 marbles. How many more did Mary have than Bob?" Obviously the story does not match the given number sentence: $13 + 19 = \blacksquare$. Encourage students to describe how the story would have to be changed to provide a proper match or, conversely, what number sentence would describe the story, e.g., $19 - 13 = \blacksquare$.

ACTIVITIES

1. If students require practice choosing the correct number sentence, see Activity 2, page 228.

2. Use the word problems generated by this page to start (or maintain) a problem box or centre or a take-home package.

OBJECTIVE

To make true equations and inequations through correct use of the symbols > , < , or =

PACING

- Level A 1-8, then odd-numbered exercises
- Level B 1-6, then even-numbered exercises
- Level C 1-4, then even-numbered exercises

RELATED AIDS

HMS—DM58.

BACKGROUND

An equation indicates a relationship of equality between two numbers.
 $4 + 7 = 6 + 5$
 $11 = 11$

An inequation indicates a relationship where one number is greater than or less than another number (an inequality).
 $6 + 7 \neq 18 - 4$
 $13 < 14$

SUGGESTIONS

Initial Activity Use the display or similar examples on the chalkboard to help students distinguish between equations and inequations. Be sure to include statements compared to statements, i.e., $4 + 9 \neq 3 + 11$.

ACTIVITIES

- See "Dial a Number Sentence" in the Activity Reservoir.
- Children may benefit from supplying the missing addends, subtrahends, and minuends in inequations like:
(a) $\$52.00 + \underline{\hspace{1cm}} < \62.00
(b) $88 - \underline{\hspace{1cm}} > 78$
(c) $\underline{\hspace{1cm}} - 50 > 101$
(d) $\underline{\hspace{1cm}} - 491 < 1491$
(e) $\$1.88 + \underline{\hspace{1cm}} > \1.89
(f) $\underline{\hspace{1cm}} + 22.1 > 22.2$

In this sort of exercise more than one answer is correct. When possible, have them marked by other children as a check.

EXTRA PRACTICE

See HMS—DM58.

Inequations

Equations

 $4 + 3 = 7$ $15.5 = 9 + 6.5$ $16 - 4 = 12$

Inequations

 $11.5 > 2 + 3.4$ $3 < 5$ $14 - 6 < 15 + 2$

Exercises

- Which are equations? Which are inequations?
- | | | | |
|--|--|---|---|
| <small>equation</small>
● $5 + 9 = 14$ | <small>inequation</small>
● $7 - 2 > 3$ | <small>inequation</small>
3. $13.2 < 18$ | <small>equation</small>
4. $6 + 3 = 2 + 7$ |
| 5. $14 - 6 = 8$
<small>equation</small> | 6. $12 > 5.2$
<small>inequation</small> | 7. $3 + 8 < 5 + 9$
<small>inequation</small> | 8. $15 = 7 + 8$
<small>equation</small> |

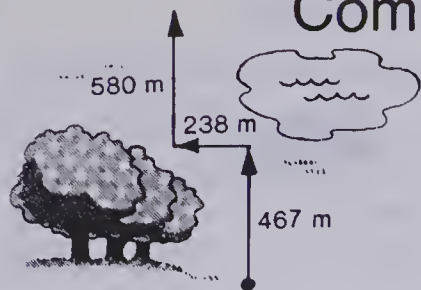
Make true number sentences. Use > , =, or < .

- | | | | | | |
|-------------------------|-------------------------|-----------------------|----------------|-----------------|---------------|
| ● $4 + 6$ | ● $13 <$ | ● $18 - 12$ | ● $3 + 4 <$ | 11. $4.5 + 6$ | ● $10.5 =$ |
| 12. $17 - 8$ | ● $7 + 5 <$ | 13. $47 + 12$ | ● $52 - 7 >$ | 14. 6.7 | ● $5.9 >$ |
| 15. $38 + 41$ | ● $88 <$ | 16. 16 | ● $7 + 6 >$ | 17. $7.2 - 2.2$ | ● $5 =$ |
| 18. $4.3 + 6.2$ | ● $15.5 <$ | 19. $26 - 14$ | ● $9 >$ | 20. $46 + 17$ | ● $63 =$ |
| 21. $1.3 + 4.2$ | ● $5.2 >$ | 22. 16 | ● $24 - 8 =$ | 23. $7.5 + 8.3$ | ● $14 >$ |
| 24. $87 + 63$ | ● $113 >$ | 25. $\$1.29 + \8.90 | ● $\$10.19 =$ | 26. 52 | ● $87 - 44 >$ |
| 27. $\$42.00$ | ● $\$35.00 + \$19.00 <$ | 28. $135 - 26$ | ● $190 - 51 <$ | | |
| 29. $\$53.00 + \18.00 | ● $\$61.00 >$ | 30. $33 + 12$ | ● $25 + 18 >$ | | |
| 31. $\$27.99$ | ● $\$14.50 + \$14.50 <$ | 32. $110 + 60$ | ● $170 =$ | | |

Using the Book Be sure students understand that, in Exercises 9-32, the objective is to determine whether the statement is true or false by completing the indicated operation. A false statement can be made true by changing the relationship symbol, rather than changing numbers.

You may wish to remind students that the answers for Exercises 1, 2, 9, and 10 are in the back of the book (page 341) and can be used to check for accuracy and answer format.

Compass Courses



Bob made a compass course.
467 m north,
then 238 m west,
then 580 m north.
How many metres altogether?

(a) Add ones.

$$\begin{array}{r} 467 \\ 238 \\ + 580 \\ \hline 5 \end{array}$$

(b) Add tens.

$$\begin{array}{r} 467 \\ 238 \\ + 580 \\ \hline 85 \end{array}$$

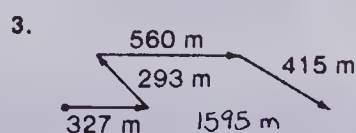
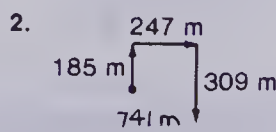
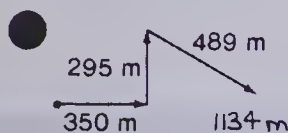
(c) Add hundreds.

$$\begin{array}{r} 467 \\ 238 \\ + 580 \\ \hline 1285 \end{array}$$

There are 1285 m altogether.

Exercises

Find how many metres there are altogether in these courses.



Add these course distances.

4.
$$\begin{array}{r} 627 \\ 158 \\ + 292 \\ \hline 1077 \end{array}$$

5.
$$\begin{array}{r} 248 \\ 362 \\ + 501 \\ \hline 1111 \end{array}$$

6.
$$\begin{array}{r} 7405 \\ 2317 \\ 6480 \\ + 2161 \\ \hline 18363 \end{array}$$

7.
$$\begin{array}{r} 4812 \\ 1007 \\ + 6715 \\ \hline 12534 \end{array}$$

8.
$$\begin{array}{r} 6241 \\ 506 \\ 1285 \\ + 4719 \\ \hline 12751 \end{array}$$

Addition — several addends (3 and 4 digits) 231

OBJECTIVE

To add several 3- and 4-digit addends

PACING

Level A All
Level B All
Level C All

VOCABULARY

compass course

RELATED AIDS

BFA COMP LAB II — 9-11.

ACTIVITIES

1. See the Fact-Folder idea in the Activity Reservoir.

2. Supply challenge cards such as: "Someone spilt paint on these. Find the missing digits." (Answers are given in brackets.)

(a)
$$\begin{array}{r} 61\blacksquare \\ 9\blacksquare7 \\ + \blacksquare33 \\ \hline 1674 \end{array} \left(\begin{array}{r} 614 \\ 927 \\ + 133 \\ \hline 1674 \end{array} \right)$$

(b)
$$\begin{array}{r} 42\blacksquare6 \\ 223\blacksquare \\ 1148 \\ + \blacksquare\blacksquare59 \\ \hline 10149 \end{array} \left(\begin{array}{r} 4206 \\ 2236 \\ 1148 \\ + 2559 \\ \hline 10149 \end{array} \right)$$

(c)
$$\begin{array}{r} \blacksquare601 \\ \blacksquare44 \\ 15\blacksquare0 \\ + 14 \\ \hline 5359 \end{array} \left(\begin{array}{r} 3601 \\ 244 \\ 1500 \\ + 14 \\ \hline 5359 \end{array} \right)$$

(d)
$$\begin{array}{r} 1\blacksquare\blacksquare5 \\ 3634 \\ + \blacksquare991 \\ \hline 8330 \end{array} \left(\begin{array}{r} 1705 \\ 3634 \\ + 2991 \\ \hline 8330 \end{array} \right)$$

Using the Book To begin this lesson you may want to briefly demonstrate the addition process illustrated in the display.

Whenever possible, encourage students to make the regrouping process part of the mental calculation rather than placing digits on top of the next column.

Suggest to students also, that this exercise would be appropriate for the use of estimation as a "precheck" device.

Example

$$\begin{array}{r} 637 \\ 278 \\ + 306 \\ \hline \end{array} \longrightarrow \begin{array}{r} 600 \\ 300 \\ + 300 \\ \hline 1200 \end{array}$$

3. Children may enjoy making their own "spilt paint" puzzles using red paint. Have them (a) keep a record of answers — before spilling, (b) be sure answers are *not* hidden.

OBJECTIVE

To round a decimal to the nearest whole number

PACING

Level A All
Level B All
Level C All

MATERIALS

display number line showing tenths

RELATED AIDS

CALC. W/BK—26.

BACKGROUND

Rounding has also been dealt with on pages 81 (to the nearest 10) and 92 (to the nearest 100). Rounding to the nearest centimetre and 10 mm is located on page 166. If you have already covered these pages, you may wish to include a quick review or "look back" as part of your initial presentation.

SUGGESTION

Initial Activity Construct a number line, similar to the one in the display.

Have the students identify the position of the decimal on the number line in relation to the nearest whole number. It is on that basis that we round "up" or "down".

Develop a chart to match your number line (similar to the one in Exercise 2).

Discuss with children the fact that since a decimal with a "5" in the tenth's place is equidistant from two whole numbers, we need some general agreement about rounding. The agreement, as with whole numbers, is that we round "up". Complete several examples before using the text.

ACTIVITIES

1. Pairs of students make a number line marked in tenths as long as desirable. Use squared paper. Place the number line on the floor.

0.	1	0.	2	0.	3	0.	4	0.	5	0.	6	0.	7
----	---	----	---	----	---	----	---	----	---	----	---	----	---

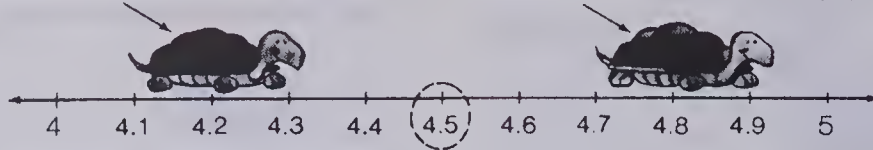
2.	9	3.	0	3.	1	3.	2	3.	3
----	---	----	---	----	---	----	---	----	---

Students take turns throwing an eraser

Rounding Decimals

Is Redback closer to 4 or 5? 4

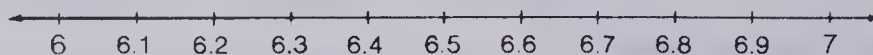
Is Blueback closer to 4 or 5? 5



Exercises

Refer to the display.

- (a) Which decimals are closer to 4 than 5? 4.1, 4.2, 4.3, 4.4
(b) Which are closer to 5? 4.6, 4.7, 4.8, 4.9
- Round each decimal to the nearest whole number.



6.1 → 6	6.6 → 7
6.2 → 6	6.7 → 7
6.3 → 6	6.8 → 7
6.4 → 6	6.9 → 7

- Is 6.5 closer to 6 or 7? 6.5 is halfway between 6 and 7

A number halfway between two numbers is rounded to the greater number.

Round to the nearest whole number.

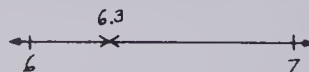
- | | | | |
|--------------|---------------|---------------|-------------|
| 4.3 → 4 | 6.8 → 7 | 24.7 → 25 | 56.2 → 56 |
| 8. 18.5 → 19 | 9. 12.1 → 12 | 10. 82.9 → 83 | 11. 3.3 → 3 |
| 12. 5.7 → 6 | 13. 27.4 → 27 | 14. 40.6 → 41 | 15. 7.5 → 8 |

232 Rounding decimals $\frac{1}{10}$'s to whole numbers

Using the Book Complete Exercises 1, 2, and 3 together with the group to ensure that the concept is understood. Assign the remaining exercises. Be sure that children are familiar with the accepted answer format. Encourage students who are having difficulty to visualize a particular decimal on a number line between two whole numbers.

Example

6.3



Since 6.3 is closer to 6 than 7, then $6.3 \rightarrow 6$ (or $6.3 \approx$ where \approx means "is approximately equal to").

on the number line. Each is to record his/her score, round it to the nearest whole number and keep a running total. The player with the highest score after 10 throws is the winner.

1.3 → 1
2.8 → 3 → 4
1.1 → 1 → 5, etc.

2. Play "Round-off Bingo". See the notes on page 81. Numbers will simply have to be modified to reflect the type of rounding on this page.

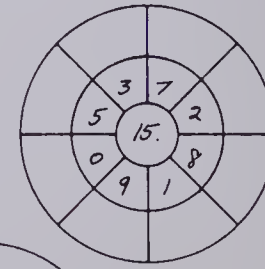
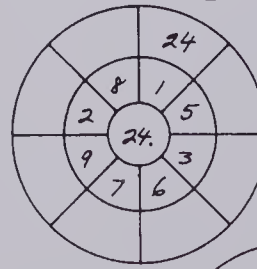
3. See "What's Happening?" as described in the Activity Reservoir. During the playing of this oral game, include rules such as I am rounding to the nearest whole number, ten, or hundred.

EXTRA PRACTICE

Round to the nearest whole number.

1. 24.1 → 24

2.

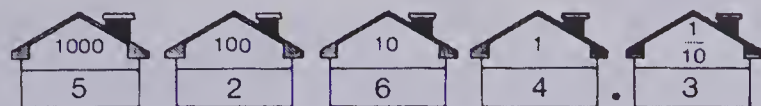


3.



Next-Door Neighbours

CHALLENGE Round 5264.3 to the nearest multiple of 1.



Step 1

Find the digit to be rounded.

5264.3

Step 2

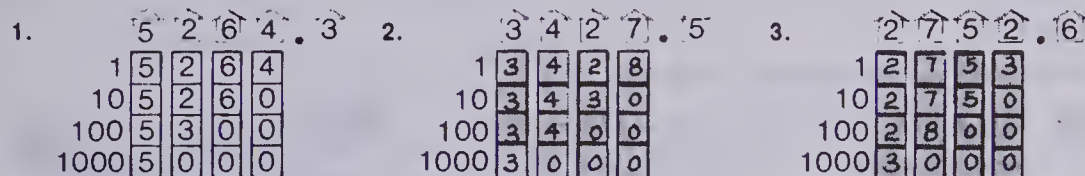
Find the next-door neighbour on the right. 5264.3

Step 3

If the neighbour is 5 or greater, round up.
If the neighbour is 4 or less, digit remains the same.



Exercises Use the 3 steps to help you round.



4. Copy and complete the chart.

Round:	4263.4	6593.8	9227.6	5735.2	8189.1	6399.9
to nearest multiple of 1.	4263	6594	9228	5735	8189	6400
to nearest multiple of 10.	4260	6590	9230	5740	8190	6400
to nearest multiple of 100.	4300	6600	9200	5700	8200	6400
to nearest multiple of 1000.	4000	7000	9000	6000	8000	6000

Rounding larger decimals — 1's, 10's, 100's, 1000's 233

Using the Book Read through the display making sure that the children understand the 3 steps in the rounding process.

Work co-operatively with students on Exercises 1, 2, and 3. Remind students that, at each rounding step in the charts, we must go back to the *original* number to apply the rounding rules.

Assign Exercise 4 for individual work.

OBJECTIVE

To round decimals to the nearest one, ten, hundred, and thousand

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS—DM59.

SUGGESTIONS

Initial Activity You may find it beneficial to draw model houses on the chalkboard, or to construct models from Bristol board in order to enhance the idea of "number neighbours" as shown in the display.

Encourage students to perceive that the "values" of the houses relate directly to a place-value chart.

Work through a number of examples with the students, rounding to the nearest 1, 10, 100, and 1000.

Note that zeros are not used to the *right* of the decimal point.

Example

Round 264.3 to the nearest multiple of 1.

$$264.3 \approx 264$$

If a zero is put in the tenth's place, then we have technically rounded to an accuracy of tenths, rather than ones.

Example

$$264.3 \approx 264.0$$

Zeros, however, are used as placeholders where appropriate to the *left* of the decimal.

Example

Round 264.3 to the nearest multiple of 100.

$$264.3 \approx 300$$

ACTIVITIES

1. See "Regatta" in the Activity Reservoir. Prepare a deck of appropriate "challenge cards" to accompany the game board (i.e., Round 5736.2 to the nearest 100; round 11.5 to the nearest multiple of 1; etc.).

2. If you have not done so already, provide a secret code — mystery riddle activity as shown in Activity 2, page 92.

EXTRA PRACTICE

See HMS—DM59.

OBJECTIVE

To use estimation in problem solving

PACING

Level A All
Level B All
Level C All

VOCABULARY

various city names as illustrated in the display

BACKGROUND

Reinforce the idea that estimation provides some important benefits.

Example

- (a) Estimation permits us to find an appropriate answer when an exact numerical solution is not necessary (e.g., distance).
- (b) Estimation provides us with an approximate answer that helps us to gauge the reasonableness of the calculated solution. This is an important "precheck" for paper-and-pencil algorithms, and even more so if the calculation is done with a mini-calculator.
- (c) Estimation, in most cases, can be done mentally.

SUGGESTIONS

Initial Activity Children might enjoy discussing and identifying vocations where estimation skills might be beneficial.

ACTIVITIES

1. Use a school atlas or a provincial road map to estimate distances between local cities and towns. Display the results on a bulletin board using the map, an estimation chart, coloured yarn, etc.

2. Prepare 10 single-step word problems (or cut them from an old arithmetic text) and paste these on envelopes. Prepare matching "estimate cards" which show the appropriate number facts rounded and calculated to yield what would be a reasonable estimate. Have the child match by placing the appropriate estimate into the correct envelope. Have a partner check and reshuffle the cards for the next participants.

3. You may wish to add another dimension to the matching activity suggested above by adding: (a) distractors (i.e., more "estimate cards" which show the right number facts, wrong order (for subtraction problems) or incorrect operation signs) and/or (b) the appropriate number sentence cards.

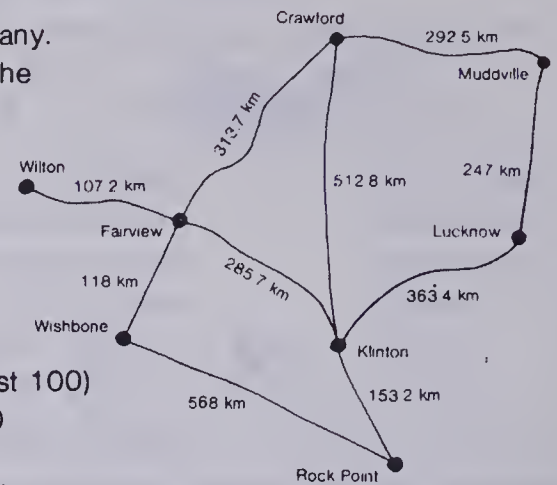
On the Road

Vicky sells books for the Hastings Company. She uses **estimation** to help her when she drives.

Wilton to Fairview: 107.2 km
Fairview to Klinton: 285.7 km
About how many kilometres altogether?

Vicky thought: $107.2 + 285.7$
Vicky rounded off: $100 + 300$ (nearest 100)
Vicky estimated: $100 + 300 = 400$

The distance is about 400 km altogether.



Exercises

Help Vicky estimate these distances.

1. Crawford to Lucknow by way of Muddville.

Vicky thought: $292.5 + 247$
Vicky rounded off: $300 + 200$ (nearest 100)
Vicky estimated: $300 + 200 = 500$
The distance is about 500 km altogether.



- | | |
|---|--|
| 2. Muddville to Klinton by way of Lucknow. $200 + 400 = 600$ km | 3. Fairview to Rock Point by way of Wishbone. $100 + 600 = 700$ km |
| 4. Wilton to Crawford by way of Fairview. $100 + 300 = 400$ km | 5. Fairview to Muddville by way of Crawford. $300 + 300 = 600$ km |
| 6. Crawford to Rock Point by way of Klinton. $500 + 200 = 700$ km | 7. Rock Point to Fairview by way of Klinton. $200 + 300 = 500$ km |

234 Estimation

Using the Book Use the display to point out that students will require their rounding skills (in this case, to the nearest multiple of 100). You may wish, at your discretion, to have students discover what would happen if they rounded the same numbers to the nearest 10, to the nearest 1. (The estimated answers more closely approximate the numerical solution, but it becomes more difficult to handle the computation mentally.)

Each student would then be required to sort the cards so that each envelope contained the correct estimate and number-sentence card.

Engineer



Exercises

Estimate, then calculate the answers.

- The Lewiston Bridge over the Niagara River is 312.9 m long.
The Forth Bridge in Scotland is 511.8 m long.
How much longer is the Forth Bridge? 198.9 m
2. The highest bridge in Colorado is 315.9 m high.
The Great Pyramid is 134.7 m high.
How much higher is the bridge? 181.2 m
3. The Humber Bridge in England is 1387.8 m long.
The Ambassador Bridge in Detroit is 555 m long.
What would the total distance be if they were placed end to end? 1942.8 m
4. The Goodyear Airship hanger is 352.5 m wide.
The widest bridge in Rhode Island is 344.1 m wide.
What would the total width be if they were placed side by side? 696.6 m
5. The C.N. Tower is 541.5 m tall.
The longest covered bridge is 384.6 m long.
If the Tower were placed on its side, how much longer would it
be than the bridge? 156.9 m

Word problems — addition and subtraction 235

Using the Book Have the problems read through once or twice to ensure that the proper names present no difficulty. Be sure that the children know how to record their answers in their workbooks before assigning the exercises.

OBJECTIVE

To solve addition and subtraction problems containing metric units in decimal form

PACING

Level A All
Level B All
Level C All

VOCABULARY

various proper names as noted in the word problems

RELATED AIDS

CALC. W/BK—25.

BACKGROUND

See the “Career Awareness” notes in the Chapter Overview, page 212.

SUGGESTIONS

Initial Activity You might begin this lesson with a discussion of particular buildings or structures in your community. Facts and figures about major buildings are sometimes available through local Chambers of Commerce. Maintenance foremen in office buildings can often provide basic measurements of height and width.

Throughout the discussion, reinforce the comparative terms “taller”, “shorter”, “longer”, etc. If using Professor Q’s four questions and the steps to accurate problem solving (pages 8, 10, 11) you may wish to review and redemonstrate these and include “estimate for reasonableness” as an added step.

ACTIVITIES

1. The bridges, buildings, and other structures mentioned on this page (or found in your own community) can provide data for graphing. There is potential also for investigation of geometric shapes and models.

2. Use metre tape, trundle wheels, etc. to gather linear measurement information about your school and/or community. Use the facts to assemble a “Did you know...?” or “Problem Book” for another class, school, or a “take-home package”.

3. See Activities from page 234.

OBJECTIVE

To add common fractions having common denominators (sums ≤ 1)

PACING

Level A 1-16
Level B 5-20
Level C 9-24

MATERIALS

bingo cards, bottle caps and buttons

RELATED AIDS

BFA COMP LAB II—65.

SUGGESTIONS

Initial Activity Use diagrams on the chalkboard or overhead projector to demonstrate the process of addition illustrated in the display.

Encourage students to state a rule or generalization to help them add, i.e., "add the numerators".

ACTIVITIES

1. Play "Bingo" as described in the Activity Reservoir. List 30 or so fractions which would be suitable sums (e.g., $\frac{3}{4}$, $\frac{2}{3}$, $\frac{5}{6}$, etc.) Have the "caller" identify two fraction addends (e.g., $\frac{1}{4} + \frac{2}{4}$, $\frac{1}{3} + \frac{1}{3}$, $\frac{2}{6} + \frac{3}{6}$...).

2. See the Fact-Folder idea in the Activity Reservoir.

3. Divide the group or class into 3's to play "Painting Fences". Provide: crayons or markers, index cards (lightly numbered — to prevent show through — with a number from 0-1000, and graph paper. The cards will be used for scoring and should be placed (well shuffled) face down on the table. First player draws the outline of a fence on graph paper and identifies what fraction of the whole fence each square represents (e.g., "tenths").

Second player colours in a portion and tells what fraction of the whole fence he/she shaded (e.g., "three tenths").

Third player does likewise (e.g., "four tenths").

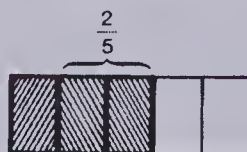
First player selects the top card from the deck and (without turning it over) writes the appropriate fraction statement (i.e., " $\frac{3}{10} + \frac{4}{10} = \frac{7}{10}$ "). First player keeps this card (still without turning it over). Players change roles till each has collected three fraction addition cards. All players turn over cards and add their scores (i.e., the numbers). Player with the highest (or lowest or closest to 50) total wins.

Painting Fences

Murray paints $\frac{1}{5}$.



Then Sandy paints $\frac{2}{5}$.



How many fifths of the fence are painted?

$$\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$$

Find a rule to help you add.

$\frac{3}{5}$ of the fence is painted.

Exercises

Add. Use your rule.

1. $\frac{2}{5} + \frac{2}{5} = \frac{4}{5}$ 2. $\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$ 3. $\frac{4}{10} + \frac{2}{10} = \frac{6}{10}$ 4. $\frac{3}{8} + \frac{4}{8} = \frac{7}{8}$
5. $\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$ 6. $\frac{5}{9} + \frac{2}{9} = \frac{7}{9}$ 7. $\frac{7}{12} + \frac{4}{12} = \frac{11}{12}$ 8. $\frac{1}{6} + \frac{2}{6} = \frac{3}{6}$
9. $\frac{3}{10} + \frac{6}{10} = \frac{9}{10}$ 10. $\frac{1}{5} + \frac{3}{5} = \frac{4}{5}$ 11. $\frac{4}{7} + \frac{1}{7} = \frac{5}{7}$ 12. $\frac{2}{4} + \frac{1}{4} = \frac{3}{4}$
13. $\frac{4}{10} + \frac{4}{10} = \frac{8}{10}$ 14. $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$ 15. $\frac{1}{6} + \frac{4}{6} = \frac{5}{6}$ 16. $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$
17. $\frac{2}{8} + \frac{5}{8} = \frac{7}{8}$ 18. $\frac{1}{10} + \frac{2}{10} = \frac{3}{10}$ 19. $\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$ 20. $\frac{8}{12} + \frac{4}{12} = \frac{12}{12}$
★ 21. $\frac{9}{20} + \frac{21}{20} = \frac{30}{20}$ ★ 22. $\frac{15}{50} + \frac{35}{50} = \frac{50}{50}$ ★ 23. $\frac{23}{50} + \frac{14}{50} = \frac{37}{50}$ ★ 24. $\frac{15}{100} + \frac{23}{100} = \frac{38}{100}$

236 Addition of fractions — common denominators

Using the Book Point out that the diagram or "fences" have been drawn very carefully so that each part is equal. Read through the display and have someone (a) make a final statement with regard to the question being asked (i.e., " $\frac{3}{5}$ of the fence is painted") and (b) state the rule to use to add fractions with like denominators ("add the numerators").

Complete Exercises 1 and 2 orally.

Assign the rest of the exercises. Encourage those who need it to sketch their own fences to help them add.

EXTRA PRACTICE

Add.

$$\frac{3}{10} + \frac{6}{10}$$

$$\frac{3}{5} + \frac{2}{5}$$

$$\frac{1}{8} + \frac{3}{8}$$

$$\frac{4}{5} + \frac{3}{5}$$

$$\frac{6}{10} + \frac{9}{10}$$

$$\frac{2}{6} + \frac{5}{6}$$

$$\frac{2}{10} + \frac{3}{10}$$

$$\frac{3}{8} + \frac{4}{8}$$

$$\frac{7}{10} + \frac{3}{10}$$

$$\frac{49}{50} + \frac{21}{50}$$

$$\frac{49}{100} + \frac{51}{100}$$

$$\frac{1}{5} + \frac{2}{5}$$

$$\frac{1}{4} + \frac{1}{4}$$

$$\frac{1}{2} + \frac{1}{2}$$

$$\frac{3}{6} + \frac{1}{6}$$

$$\star \frac{4}{10} + \frac{7}{10}$$

$$\frac{2}{3} + \frac{2}{3}$$

$$\frac{3}{4} + \frac{2}{4}$$

$$\frac{4}{8} + \frac{6}{8}$$

$$\frac{5}{10} + \frac{7}{10}$$

Washing Windows

$\frac{5}{6}$ of the windows are dirty.



Michael washed $\frac{2}{6}$



What fraction of the windows are left to wash?

$$\frac{5}{6} - \frac{2}{6} = \frac{3}{6}$$

$\frac{3}{6}$ of the windows are left to wash.



Find a rule to help you subtract.

Exercises

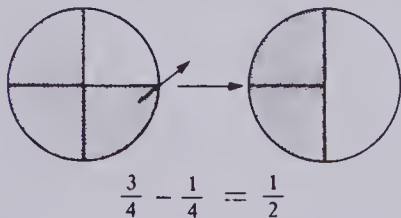
Subtract. Use your rule.

1. $\frac{4}{6} - \frac{3}{6} = \frac{1}{6}$
2. $\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$
3. $\frac{7}{10} - \frac{3}{10} = \frac{4}{10}$
4. $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$
5. $\frac{10}{12} - \frac{7}{12} = \frac{3}{12}$
6. $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$
7. $\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$
8. $\frac{4}{7} - \frac{2}{7} = \frac{2}{7}$
9. $\frac{5}{9} - \frac{4}{9} = \frac{1}{9}$
10. $\frac{5}{6} - \frac{2}{6} = \frac{3}{6}$
11. $\frac{10}{10} - \frac{6}{10} = \frac{4}{10}$
12. $\frac{7}{8} - \frac{6}{8} = \frac{1}{8}$
13. $\frac{7}{12} - \frac{1}{12} = \frac{6}{12}$
14. $\frac{3}{5} - \frac{2}{5} = \frac{1}{5}$
15. $\frac{6}{8} - \frac{3}{8} = \frac{3}{8}$
16. $\frac{7}{7} - \frac{6}{7} = \frac{1}{7}$
17. $\frac{5}{10} - \frac{2}{10} = \frac{3}{10}$
18. $\frac{5}{5} - \frac{3}{5} = \frac{2}{5}$
19. $\frac{2}{4} - \frac{1}{4} = \frac{1}{4}$
20. $\frac{9}{10} - \frac{4}{10} = \frac{5}{10}$
- ★ 21. $\frac{19}{20} - \frac{8}{20} = \frac{11}{20}$
- ★ 22. $\frac{35}{50} - \frac{35}{50} = \frac{0}{50}$
- ★ 23. $\frac{88}{100} - \frac{33}{100} = \frac{55}{100}$

Subtraction of fractions — common denominators 237

Using the Book Having read through the display, have someone verbalize (a) a final statement ($\frac{3}{6}$ of the windows are left to wash) and (b) a rule (subtract the numerators). Relate this rule to the rule used on page 236.

If you feel some students would benefit from seeing the actual “taking away”, meaning of subtraction of fractions, use a fraction wheel on the flannel board or on the overhead projector.



Assign the exercises.

ACTIVITIES

1. Provide students who need additional concrete experiences with fraction-wheel kits, either demonstration size or student size made from paper plates. Have the students work in pairs. One student makes a fraction using the fraction wheel, then removes one or more pieces. The second student must write the subtraction number problem with the answer. Children exchange roles.

2. Children may enjoy playing “Bottle Caps and Buttons”. Make a 3 x 3 square, each square 5 cm x 5 cm. Make cards with questions like those on page 237 and put one face down in each square. Student one chooses any one of the cards, turns it over, and answers the question. If the answer is correct, the student places a bottle cap in the square. If the answer is wrong, the card is put back face down. The object of the game is to get three bottle

OBJECTIVE

To subtract common fractions having common denominators (differences < 1)

PACING

Level A 1-16
Level B 5-20
Level C 9-23

MATERIALS

flannel board fractions or overhead projector, transparencies, bottle caps and buttons cards

RELATED AIDS

HMS—DM60.
BFA COMP LAB II —66.

SUGGESTIONS

Initial Activity Use diagrams on the chalkboard or overhead projector similar to those illustrated in the display.

Encourage students to verbalize a rule after several examples have been provided, i.e., “subtract the numerators”.

caps or buttons in any row, column, or diagonal.

3. Children may enjoy playing “Bingo” as described in the Activity Reservoir, but modified to include subtraction of fractions.

EXTRA PRACTICE

1. See HMS—DM60.
2. Subtract.

$$\begin{array}{lll} \frac{7}{10} - \frac{3}{10} & \frac{7}{8} - \frac{2}{8} & \frac{5}{6} - \frac{3}{6} \\ \frac{8}{10} - \frac{5}{10} & \frac{6}{8} - \frac{1}{8} & \frac{10}{10} - \frac{3}{10} \\ \frac{8}{8} - \frac{3}{8} & \frac{11}{12} - \frac{7}{12} & \\ \star \frac{15}{10} - \frac{7}{10} & \frac{12}{10} - \frac{3}{10} & \frac{9}{8} - \frac{1}{8} \\ \frac{11}{10} - \frac{1}{10} & \frac{50}{100} - \frac{25}{100} & \frac{35}{50} - \frac{17}{50} \\ \frac{80}{100} - \frac{28}{100} & \frac{41}{50} - \frac{29}{50} & \end{array}$$

OBJECTIVE

To change halves and fifths to decimals

PACING

Level A All
Level B All
Level C All

RELATED AIDS

BFA COMP LAB II—82.

BACKGROUND

The display on page 238 uses the idea of equal area to develop the relationship between halves and tenths, and fifths and tenths.

No formal algorithm is suggested here, although some students may quickly see that fifths can be changed to tenths by simply multiplying by $\frac{2}{2}$ (or multiply both the numerator and denominator by 2).

Students should already be familiar with changing tenths to decimals from the work on page 132.

SUGGESTIONS

Initial Activity Review the work on equivalent fractions as presented on page 130. An effective way to do this is to duplicate shapes as shown on page 130 on a transparency (i.e., thirds and sixths). Colour $\frac{1}{3}$ of each and overlap them to show equivalence. Repeat for other equivalent fractions including tenths. You may also wish to mention changing fractional tenths to decimals as covered on page 132.

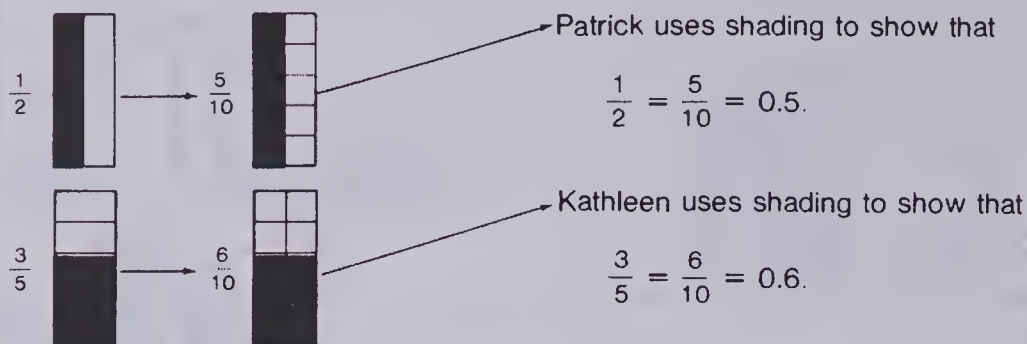
ACTIVITIES

1. The game of "Concentration" may provide students with practice in changing fractions to decimals. Make one set of cards with a fraction number on each card and a second set of cards with a matching decimal number on each card. The general rules for "Concentration" are in the Activity Reservoir.

2. Adapt the game of "Bingo" so that students have cards with decimal numbers in the squares while the caller uses the fraction name when calling each number.

3. Play "Dominoes" as described in the Activity Reservoir.

Changing Fractions to Decimals



Exercises

Use the shading to change these fractions to decimals.



$$\frac{2}{5} = \frac{4}{10} = 0.4$$



$$\frac{1}{5} = \frac{2}{10} = 0.2$$



$$\frac{5}{5} = \frac{10}{10} = 1.0$$

Change these tenths to decimals.

1. $\frac{3}{10} = 0.3$ 2. $\frac{7}{10} = 0.7$ 3. $\frac{1}{10} = 0.1$ 4. $\frac{10}{10} = 1.0$ 5. $\frac{5}{10} = 0.5$ 6. $\frac{4}{10} = 0.4$ 7. $\frac{8}{10} = 0.8$

Write each fraction as tenths, then change to a decimal.

8. $\frac{3}{5} = \frac{6}{10} = 0.6$ 9. $\frac{2}{2} = \frac{10}{10} = 1.0$ 10. $\frac{1}{5} = \frac{2}{10} = 0.2$

11. $\frac{2}{5} = \frac{4}{10} = 0.4$ 12. $\frac{5}{5} = \frac{10}{10} = 1.0$ 13. $\frac{1}{2} = \frac{5}{10} = 0.5$

238 Changing $\frac{1}{2}$'s and $\frac{1}{5}$'s to decimals

Using the Book Discuss the display and the method for changing the picture of halves to tenths to decimals so that a comparison can be made. Complete Exercises 1, 2, and 3 orally as these contain clues and hints.

Assign the exercises.

Adding and Subtracting

We can use decimals to add fractions.

Fred ate $\frac{1}{5}$ of the pie for lunch.

He ate $\frac{1}{10}$ for dinner.

How much did he eat?

He ate 0.3 of the pie.

He ate $\frac{1}{5} + \frac{1}{10}$

Change the fractions to decimals.

$$\begin{aligned} \frac{1}{5} + \frac{1}{10} &= 0.2 + 0.1 \\ &= 0.3 \end{aligned} \qquad \begin{aligned} \frac{1}{5} &= 0.2 \\ \frac{1}{10} &= 0.1 \end{aligned}$$

Exercises

Change to decimals, then add.

$$\begin{aligned} 1. \frac{1}{5} + \frac{2}{5} &= \square \rightarrow 0.2 + 0.4 = \square \quad 0.6 & 2. \frac{3}{10} + \frac{5}{10} &\rightarrow 0.3 + 0.5 = \square \quad 0.8 \\ \frac{3}{5} + \frac{1}{5} &= \square \quad 0.6 + 0.2 = 0.8 & \frac{1}{10} + \frac{4}{10} &= \square \quad 0.1 + 0.4 = 0.5 & 5. \frac{4}{5} + \frac{1}{5} &= \square \quad 0.8 + 0.2 = 1.0 \\ 6. \frac{6}{10} + \frac{3}{10} &= \square \quad 0.6 + 0.3 = 0.9 & 7. \frac{1}{2} + \frac{1}{5} &= \square \quad 0.5 + 0.2 = 0.7 & 8. \frac{2}{10} + \frac{7}{10} &= \square \quad 0.2 + 0.7 = 0.9 \end{aligned}$$

Change to decimals, then subtract.

$$\begin{aligned} 9. \frac{4}{5} - \frac{1}{5} &= \square \rightarrow 0.8 - 0.2 = \square \quad 0.6 & 10. \frac{8}{10} - \frac{3}{10} &= \square \rightarrow 0.8 - 0.3 = \square \quad 0.5 \\ \frac{3}{5} - \frac{2}{5} &= \square \quad 0.6 - 0.4 = 0.2 & \frac{5}{5} - \frac{3}{5} &= \square \quad 1.0 - 0.6 = 0.4 & 13. \frac{7}{10} - \frac{3}{10} &= \square \quad 0.7 - 0.3 = 0.4 \\ 14. \frac{9}{10} - \frac{5}{10} &= \square \quad 0.9 - 0.5 = 0.4 & 15. \frac{4}{5} - \frac{1}{2} &= \square \quad 0.8 - 0.5 = 0.3 & 16. \frac{5}{10} - \frac{1}{10} &= \square \quad 0.5 - 0.1 = 0.4 \\ 17. \frac{6}{10} - \frac{4}{10} &= \square \quad 0.6 - 0.4 = 0.2 & 18. \frac{9}{10} - \frac{3}{10} &= \square \quad 0.9 - 0.3 = 0.6 & 19. \frac{4}{10} - \frac{1}{10} &= \square \quad 0.4 - 0.1 = 0.3 \end{aligned}$$

Changing fractions to decimals 239

Using the Book Do orally Exercises 1, 2, 9, and 10 and have students explain how the decimal numbers were obtained.

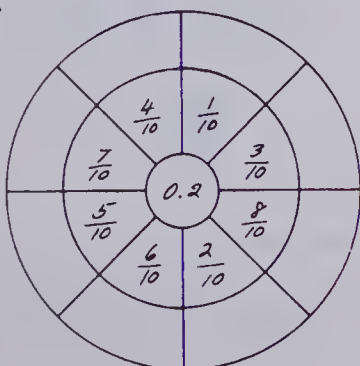
Remind students (if necessary) that you line up the decimal points before adding or subtracting decimal numbers.

Assign the remainder of the page.

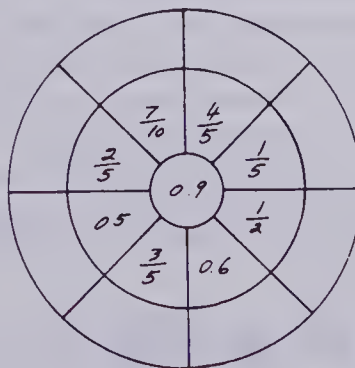
ACTIVITIES

1. Make up large practice boards plasticized so water-soluble felt pens can be used on them (or use DM19 to construct consumable handouts).

(a) Add.



(b) Subtract.



2. To develop the relationship between addition and subtraction as well as to develop the computational

OBJECTIVE

To change fractions to decimals for addition and subtraction

PACING

Level A 1-5, 8-16

Level B All

Level C 4-8, 12-19

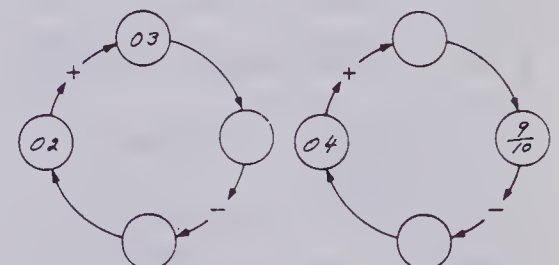
RELATED AIDS

HMS—DM19.

SUGGESTIONS

Initial Activity Review the method for changing halves and fifths to tenths and emphasize that this should be done before adding or subtracting fractions. If necessary, provide additional practice in this skill before proceeding.

skills, provide the students with a duplicated page with two numbers shown on each diagram. The student is to write in the other two numbers.



3. Prepare a set of circles (paper plates) cut into halves, thirds, quarters, fifths, sixths, eighths, and tenths. Label each. Students are to make wholes by combining pieces, e.g., $\frac{1}{2} + \frac{1}{4} + \frac{1}{4} = 1$. The students write sentences in their books.
Note: Have students add using only concrete objects.

OBJECTIVE

To write a fraction for parts of a set

PACING

- Level A All
- Level B All
- Level C All

VOCABULARY

decorated

MATERIALS

coloured blocks, various classroom sets

SUGGESTIONS

Initial Activity Introduce the concept of a fraction through the use of concrete materials and oral exercises. Have the students set out 5 blocks (3 red, 2 green) and talk about the number of red compared to the total number of blocks and the number of green compared to the total number of blocks. Use objects in the students' environment for comparison (boys of total class, girls of total class, number of correct test questions, etc.).


ACTIVITIES

1. Ask students to draw a picture which illustrates a fraction. Each should write the fraction illustrated.
2. Each student can draw a picture or use one from a newspaper or magazine which illustrates a fraction. Number and post them on the bulletin board. Have the students identify the fraction illustrated in each.
3. Prepare a set of relevant, search-activity cards for use in your classroom, school, etc.


Example

1. What fraction of your feet are "right"?
2. What fraction of people in our classroom have blue eyes?
3. What fraction of classrooms in our school are Grade 4?
4. What fraction of cars in our school parking lot are brown?
5. What fraction of teachers in our school are women?
6. What fraction of days of the week are Friday?
7. What fraction of days of the week do we go to school?
8. What fraction of the hours in a day do you sleep?
9. What fraction of people in your family go to school?
10. What fraction of letters of the alphabet are always vowels?

Fractions


Fractions of a Set	
3 ← number of deer with antlers	
5 ← number of deer	
$\frac{3}{5}$ of the deer have antlers.	

Exercises





How many trees are decorated? 8
How many trees in all? 10
Write a fraction for the trees decorated. $\frac{8}{10}$


3. Write a fraction for the birds on the wire. $\frac{3}{8}$




Write a fraction for the shaded part of each set.



5.  $\frac{2}{5}$

6.  $\frac{3}{8}$


7.  $\frac{5}{8}$

8.  $\frac{8}{10}$

Write a fraction for the boys with dogs. $\frac{5}{10}$



4. Write a fraction for the children in the water. $\frac{2}{5}$



240 Concept of fraction

Using the Book Develop the concept of the fraction of a set. It is an extension of the fraction of a whole:

number identified $\longrightarrow \frac{3}{5}$
total number in set $\longrightarrow \frac{5}{5}$

Use a picture from social studies or science such as a picture of 10 trees, 7 of which are evergreens and 3 deciduous. Ask:
"How many are evergreens?"
"How many trees altogether?"
"What fraction of the trees are evergreens?"
Repeat for trees that lose their leaves.

Assign the exercises. Have the children look carefully to find the shaded portions in Exercises 5-8.

EXTRA PRACTICE

1. Write some reworded questions which refer to the other set in each case pictured on this pupil page, i.e., "What fraction of the deer do not have antlers?" "Write a fraction for the white part of each set.", etc.
2. Write a fraction for the shaded part of each set.

(a) 

(b) 

Finding Parts of a Set



10 flowers.

$\frac{1}{2}$ shaded.

How many shaded?

$$\frac{1}{2} \text{ of } 10 = 5$$

$$10 \div 2 = 5$$

$\frac{5}{10}$ of the flowers are shaded.



$\frac{1}{3}$ of dogs are sitting.

How many sitting?

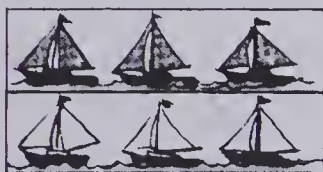
Copy and complete. $\frac{1}{3}$ of 6 = \blacksquare 2

$$6 \div 3 = \blacktriangledown 2$$

$\frac{2}{6}$ of the dogs are sitting.

Exercises

Complete.



$$\frac{1}{2} \text{ of } 6 = \blacksquare 3$$

$$6 \div 2 = \blacksquare 3$$

2.



$$\frac{1}{4} \text{ of } 12 = \blacksquare 3$$

$$12 \div 4 = \blacksquare 3$$

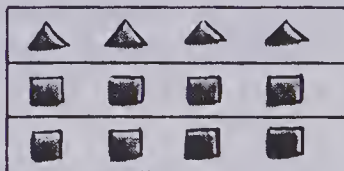
3.



$$\frac{1}{5} \text{ of } 15 = \blacksquare 3$$

$$15 \div 5 = \blacksquare 3$$

4.



$$\frac{1}{3} \text{ of } 12 = \blacksquare 4$$

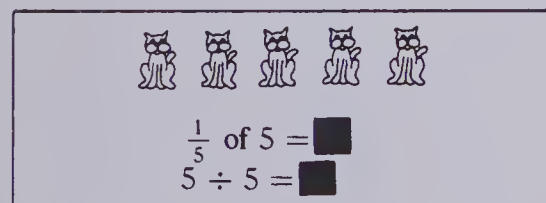
$$12 \div 3 = \blacksquare 4$$

Fractions, parts of a set 241

Using the Book Refer to the display asking the student what fraction of the flowers are shaded. Then ask how many are shaded. Guide them to see the relationship—that $\frac{1}{2}$ of 10 = 5 is the same as $10 \div 2 = 5$. This pattern may come to the student only after a number of examples.

ACTIVITIES

1. Prepare a set of cards, each containing a set of objects with a question.



Students are to copy and complete the statements in their books.

2. Prepare a set of circles cut into fractions as described in Activity 3,

page 239. Have the students make one whole using fractions of the same kind: $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}$. Have them take away one piece and write a sentence, e.g., $\frac{1}{5}$ of 5 = 1.

3. Have students cut pictures and advertisements from magazines and pose questions relating to them, e.g., "What fraction of the people are men?", "What fraction of the wheels of the car can you see?", etc. Have these mounted on cards to become part of a Problem Cards Box, etc.

Variation. Instead of posing questions, have children write statements: " $\frac{3}{7}$ of the people are men." Use these as a bulletin-board display.

OBJECTIVE

To find a fractional part of a set given the number in a set

PACING

Level A All

Level B All

Level C All

SUGGESTIONS

Initial Activity Introduce the idea of parts of a set through the use of concrete materials. Have the students identify parts (one half, one third, etc.) of sets of pencils, books, children in class, etc. Initially, students should divide objects into two, three, etc. groups to internalize the idea of one half, one third, etc. If you have not already done so, see the "search" cards in Activity 3, page 240. Completing or discussing these would be a good way to introduce this lesson.

EXTRA PRACTICE

Solve.

1. 10 candles.
 $\frac{1}{5}$ lit.
How many lit?



2. 6 candles.
 $\frac{1}{3}$ lit.
How many are lit?



3. 10 birds.
 $\frac{1}{2}$ flew away.
How many flew away?



4. 8 birds.
 $\frac{1}{4}$ flew away.
How many stayed?



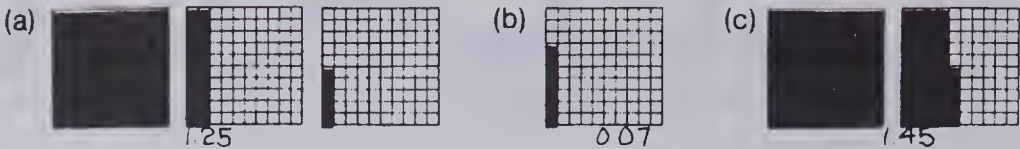
OBJECTIVE
To evaluate achievement of the chapter objectives

PACING
Level A All
Level B All
Level C All

RELATED AIDS
HMS—DM61.

Chapter Test

1. Write the decimal for each.



2. Write as a decimal.

(a) $\frac{24}{100}$ 0.24 (b) $\frac{5}{100}$ 0.05 (c) $\frac{1}{2}$ 0.5 (d) $\frac{1}{5}$ 0.2

3. Write the numeral: one hundred and twenty-seven hundredths. 100.27

4. Compare. Use $>$, $<$, or $=$.

(a) $321.6 \bullet 321.7 <$ (b) $54.73 \bullet 547.3 <$ (c) $7.5 + 3.1 \bullet 10.4 >$

5. Find the missing addend.

(a) $33 + \overset{21}{\blacksquare} = 54$ (b) $\overset{32.9}{\blacksquare} + 31.2 = 64.1$ (c) $7.5 + \overset{4.8}{\blacksquare} = 12.3$

6. Round:

(a) 825.3 to the nearest multiple of 100. 800
(b) 135.5 to the nearest whole number. 136

7. Add.

(a)
$$\begin{array}{r} 291.37 \\ + 264.38 \\ \hline 555.75 \end{array}$$

(b)
$$\begin{array}{r} 1458.72 \\ + 432.19 \\ \hline 1890.91 \end{array}$$

8. Subtract.

(a)
$$\begin{array}{r} 384.42 \\ - 196.59 \\ \hline 187.83 \end{array}$$

(b)
$$\begin{array}{r} 1564.79 \\ - 961.92 \\ \hline 602.87 \end{array}$$

242 Chapter 8 test

Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 212).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1, 3	A	215
2	E	215, 238
4	B	225, 226
5, 7, 8	C	221, 223, 227
6	D	232, 233

Cumulative Review

1. Name the shape.

(a)



rectangle

(b)



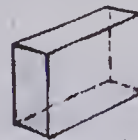
cone

(c)



cylinder

(d)



prism

2. Compare. Use $>$, $<$, or $=$.

(a) $16.1 \bullet 14.8 >$

(b) $25 + 18 \bullet 33 >$

(c) $72 - 38 \bullet 34 =$

3. Find the missing addends.

(a) $14 + \overset{23}{\blacksquare} = 37$

(b) $\overset{0.9}{\blacksquare} + 1.5 = 2.4$

(c) $\$4.95 + \overset{\$5.55}{\blacksquare} = \$10.50$

4. Round to the nearest multiple of 100.

(a) $362 \rightarrow 400$

(b) $209 \rightarrow 200$

(c) $851 \rightarrow 900$

5. Add.

$$\begin{array}{r} 307.4 \\ 462.0 \\ + 811.8 \\ \hline 1581.2 \end{array}$$

$$\begin{array}{r} 7205 \\ 8391 \\ + 7640 \\ \hline 23236 \end{array}$$

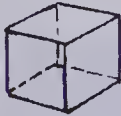
6. Subtract.

$$\begin{array}{r} 4705.1 \\ - 3297.5 \\ \hline 1407.6 \end{array}$$

$$\begin{array}{r} 810.2 \\ - 35.6 \\ \hline 774.6 \end{array}$$

7. How many corners, edges, and faces?

(a)



8 corners
12 edges
6 faces

(b)



5 corners
8 edges
5 faces

Solve.

8. Leaping Louie, the champion jumping frog, made a jump of 4.16 m.

Then he made a jump of 3.95 m.

How far did he jump altogether? 8.11 m

OBJECTIVE

To review and test selected concepts and skills previously covered

PACING

Level A All

Level B All

Level C All

Using the Book This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1(a)	188
1(b)	195
1(c)	194
1(d)	186
2(a)	146
2(b), 2(c)	230
3(a)	9
3(b), 3(c)	227
4	92
5(a)	148
5(b)	231
6	223
7(a)	185
7(b)	189
8	221

CHAPTER 9 OVERVIEW

This chapter continues the multiplication and division process introduced in Chapter 4. At this time, children will be required to multiply up to 3 digits by 2 digits and to divide using the “short form” to yield 3-digit quotients. Area and volume are also introduced, moving from the counting of nonstandard units to using multiplication to find area and volume in square and cubic centimetres and metres.

OBJECTIVES

- A To find missing factors, and dividends using related number sentences; to solve word problems
- B To use number patterns to multiply and divide a decimal (tenth) by 10
- C To use rounding and estimating in multiplication; to multiply whole numbers up to and including 3 digits by 2 digits
- D To introduce the stages and processes leading to the use of the short form of division; to divide yielding whole number quotients up to 3 digits with remainders; to introduce the divisibility rules for the numbers 2-5
- E To calculate area and volume involving square centimetres, square metres and cubic centimetres, cubic metres by using multiplication

BACKGROUND

The close relationship between multiplication and division as revealed in Chapter 4 is further extended here. Using multiplication facts to help divide ($3 \times 4 = 12$, therefore $12 \div 4 = 3$) can also help find the value of missing factors, divisors, and dividends ($n \times 3 = 27$, therefore $27 \div 3 = n$). Once established, this can be clearly applied to solve word problems, especially if using this sequence: answer Professor Q's 4 questions; write an open number sentence; rewrite; make the number sentence true.

Also a knowledge of multiplication is necessary when using the division algorithm. It is useful not only in deciding which multiples to use, but in completing the computation itself.

$$\begin{array}{r} 3 \longleftarrow \text{(Use multiples of 10. Using 100's would be too high.)} \\ 4 \overline{) 137} \\ \underline{120} \longleftarrow (4 \times 30 = 120) \\ 17 \end{array}$$

Proficiency in estimation is also of importance when multiplying and dividing. Not only does it help answer

the question “Is my answer reasonable?”, but it is also an integral part of the division process: $4 \overline{) 214}$, estimate 50, write 5 in the ten's place.

The concepts of area and volume may be more easily grasped if presented in these steps: (a) manipulate real objects such as squares and cubes, (b) counting the nonstandard units (i.e., square and cubes), (c) using and counting standard units (square centimetres, square metres, cubic centimetres, cubic metres), and (d) computing area and volume by using multiplication.

In this text, we use these definitions: “area of a rectangle: number of squares in 1 row multiplied by the number of rows”; “volume: number of cubic units in 1 layer multiplied by the number of layers”.

We feel that this groundwork is essential to the basic understanding and application of the formulas when they are presented in Level 5 of the program.

MATERIALS

paper, scissors
geo-boards
pictures of tiles
rulers
centimetre and metre tape measures
cutouts of square centimetres and metres
blocks
boxes into which the blocks will evenly fit
newspapers, wire
metre sticks

CAREER AWARENESS

Construction Worker [256]

Once a building project's plans have been finalized, and approved by lawyers, architects, and engineers, the construction worker helps make their ideas a reality. Construction workers for various contracting companies are involved in all aspects of the building process: digging and laying foundations; landscaping; erecting walls, drywall, and super structure using iron and steel; installing pipes, wiring; bricklaying and plastering; etc.

Theirs is a physically demanding job often calling for extended travel, long hours, seasonal employment, and uncomfortable working conditions. A construction worker must be a proficient, efficient estimator and measurer and have a broad knowledge of many types of expensive, powerful machines and tools.

Construction workers may learn their trade on the job as an apprentice (explain this term) or by taking specialized training in a technical institution prior to apprenticing.

Tune Up

Multiply.

1. (a) $6 \times 5 \times 4$ ¹²⁰ (b) $2 \times 8 \times 5$ ⁸⁰ (c) $3 \times 4 \times 5$ ⁶⁰ (d) $7 \times 4 \times 2$ ⁵⁶ (e) $8 \times 3 \times 5$ ¹²⁰

2. (a) $\begin{array}{r} 100 \\ \times 4 \\ \hline 400 \end{array}$ (b) $\begin{array}{r} 200 \\ \times 5 \\ \hline 1000 \end{array}$ (c) $\begin{array}{r} 400 \\ \times 6 \\ \hline 2400 \end{array}$ (d) $\begin{array}{r} 700 \\ \times 3 \\ \hline 2100 \end{array}$ (e) $\begin{array}{r} 600 \\ \times 7 \\ \hline 4200 \end{array}$

3. (a) $\begin{array}{r} 47 \\ \times 6 \\ \hline 282 \end{array}$ (b) $\begin{array}{r} 38 \\ \times 4 \\ \hline 152 \end{array}$ (c) $\begin{array}{r} 73 \\ \times 9 \\ \hline 657 \end{array}$ (d) $\begin{array}{r} 28 \\ \times 7 \\ \hline 196 \end{array}$ (e) $\begin{array}{r} 85 \\ \times 5 \\ \hline 425 \end{array}$

4. (a) $\begin{array}{r} 227 \\ \times 6 \\ \hline 1362 \end{array}$ (b) $\begin{array}{r} 142 \\ \times 9 \\ \hline 1278 \end{array}$ (c) $\begin{array}{r} 353 \\ \times 4 \\ \hline 1412 \end{array}$ (d) $\begin{array}{r} 482 \\ \times 8 \\ \hline 3856 \end{array}$ (e) $\begin{array}{r} 299 \\ \times 7 \\ \hline 2093 \end{array}$

Divide.

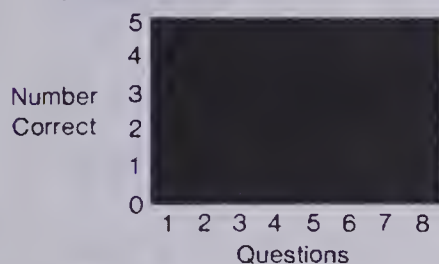
5. (a) $8 \div 1$ ⁸ (b) $1 \overline{)45}$ ⁴⁵ (c) $15 \div 1$ ¹⁵ (d) $1 \overline{)635}$ ⁶³⁵ (e) $99 \div 1$ ⁹⁹

6. (a) $33 \div 8$ ^{4R1} (b) $5 \overline{)47}$ ^{9R2} (c) $52 \div 7$ ^{7R3} (d) $9 \overline{)68}$ ^{7R5} (e) $46 \div 6$ ^{7R4}

7. (a) $124 \div 4$ ³¹ (b) $5 \overline{)230}$ ⁴⁶ (c) $296 \div 8$ ³⁷ (d) $3 \overline{)111}$ ³⁷ (e) $477 \div 9$ ⁵³

8. (a) $0 \div 3$ ⁰ (b) $8 \div 8$ ¹ (c) $0 \div 16$ ⁰ (d) $0 \div 47$ ⁰ (e) $38 \div 38$ ¹

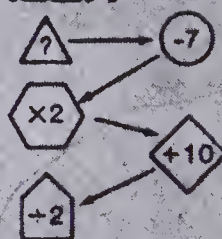
Copy the chart. Graph your results.



BRAINTICKLER

The final answer is 16.

What number did I start with? 18



OBJECTIVE

To review multiplication and division of whole numbers

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS — DM26.

ACTIVITIES

1. You may wish to provide graph paper and have the children graph their results as suggested at the bottom of the page.

2. Provide similar, more challenging puzzles (i.e., longer larger numbers), as suggested by the Braintickler. The "trick" is to start with the final answer and do the opposite operation using the data supplied (i.e., $16 \times 2 - 10 \div 2$, etc.).

3. Some children, knowing the formula, may be able to write Brainticklers of this sort by themselves.

Using the Book This page is designed to review and maintain skills in multiplication and division. You may wish to assign the page as part of your ongoing drill program, or you may wish to use it as an informal testing device. Whatever the case, it is recommended that the page be assigned over a number of sittings or periods, particularly for less-able students.

Computation has two aspects: accuracy and speed. While no time limit is indicated or recommended here, you may wish to have each individual student record his or her time for each set of questions. The chart below shows exactly where each topic was handled in the text.

Exercise	Topic	Page
1	Multiplication with 3 factors	82
2	Multiplication of multiples of 10	83
3	Multiplication of 2 digits by 1 digit with regrouping	89
4	Multiplication of 3 digits by 1 digit with regrouping	95
5	Division by 1	106
6	Division with remainders	113
7	Division (2-digit quotients)	120
8(a), 8(c), 8(d)	Division involving zero	123
8(b), 8(e)	Division involving one	106

OBJECTIVE

To find missing factors through the inverse operation of division

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activity Briefly review the terms in multiplication.

Factor		Factor		Product
5	\times	9	$=$	45

Consider also a review of the relationship between multiplication and division (i.e., inverse operations). You might use the "Since I Know ... Then I Know" chart.

Since I Know	Then I Know
--------------	-------------

(a) $5 \times 9 = 45$	$45 \div 9 = 5$
(b) $9 \times 5 = 45$	$45 \div 5 = 9$

Use the chart to orally reinforce the relationship between multiplication and division.

(a) Multiplication — "5 sets of 9 equal 45."

Division — "There are 5 sets of 9 in 45."

(b) Multiplication — "9 sets of 5 equal 45."

Division — "There are 9 sets of 5 in 45."

Move to the next stage of development which shows that two division statements can be derived from one multiplication statement.

Since I Know	Then I Know
--------------	-------------

(a) $6 \times 7 = 42$	$42 \div 7 = 6$ and $42 \div 6 = 7$
-----------------------	---

Encourage students to see that division of the product by one of the factors will result in the other factor.

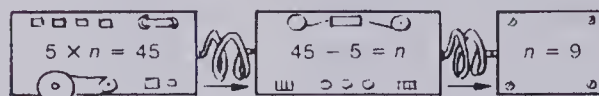
Use the display (or equivalent chalkboard examples) to point out the value of inverse operations because they permit us to find missing factors.

Some students might insist the $5 \times n = 45$ should be rewritten as $45 \div n = 5$. You might point out that since multiplication is commutative, $5 \times n = n \times 5$, therefore $5 \times n = 45$ can legitimately be rewritten as $45 \div 5 = n$. Also remind students that we divide that product by the *known* factor in order to discover the value of the missing factor. (Notice also that the missing quantity is "isolated" on the right side of the equation.)

Machines for Missing Factors

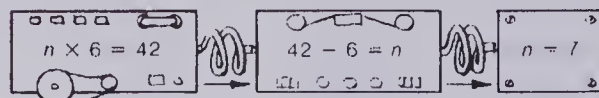
Dr. Morrow has invented a machine.

Colette uses it to find the missing factor in $5 \times n = 45$.



Now Colette can write $5 \times 9 = 45$.

Tony uses it to find the missing factor in $n \times 6 = 42$.

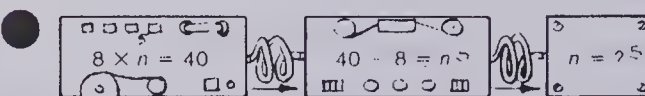


Now Tony can write $7 \times 6 = 42$.

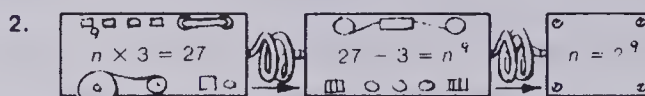
Describe how the machine works!

Exercises

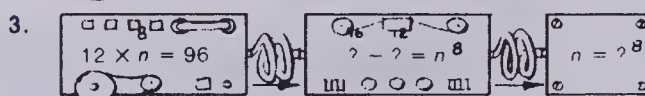
Find the missing factors.



You can write $8 \times 5 = 40$.



You can write $9 \times 3 = 27$.



You can write $8 \times 12 = 96$.

4. $6 \times n = 24$ $6 \times n = 30$ $5 \times n = 70$ (d) $10 \times n = 40$

5. (a) $n \times 8 = 56$ (b) $n \times 9 = 36$ (c) $n \times 11 = 55$ (d) $n \times 8 = 48$

6. (a) $3 \times n = 66$ (b) $n \times 7 = 91$ (c) $6 \times n = 72$ (d) $n \times 8 = 32$

246 Missing factors

Using the Book Work together with students on Exercises 1-3. When assigning the rest of the exercises, indicate to students that they should include the accompanying division statement for Exercises 4 to 6.

ACTIVITIES

1. Play "Concentration" as described in the Activity Reservoir. Use matching multiplication and division facts (i.e., $6 \times 7 = 42$, $42 \div 7 = 6$).

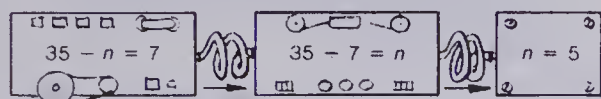
2. Play "Factor Machine". Provide a set of index cards, each one containing a multiplication statement of

the sort on this page (i.e., $n \times 11 = 55$). Place these cards in a box (or Factor Machine). Players (2-4) take turns reaching into box, selecting a card, and computing the missing factor. A correct answer yields a score equal to the missing factor. Player closest to 25 after all have had 5 turns, is the winner.

Division Machines

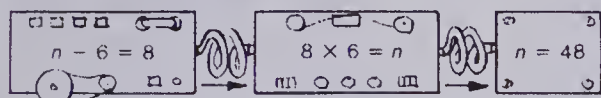
Dr. Morrow's machine can be used another way!

Colette uses it to find the missing divisor in $35 \div n = 7$.



Now Colette can write $35 \div 5 = 7$.

Tony uses it to find the missing dividend in $n \div 6 = 8$.

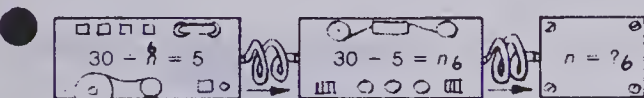


Now Tony can write $48 \div 6 = 8$.

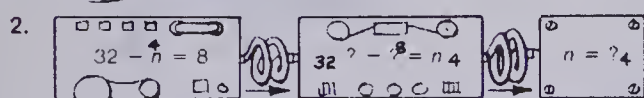
Describe how the machine works this time!

Exercises

Find the missing numbers.



You can write $30 \div 5 = 6$.



You can write $32 \div 4 = 8$.



You can write $56 \div 7 = 8$.

4. (a) $12 \div n = 6$ (b) $28 \div n = 4$ (c) $42 \div n = 6$ (d) $49 \div n = 7$

5. (a) $\frac{24}{n} - 8 = 3$ (b) $\frac{45}{n} \div 9 = 5$ (c) $\frac{20}{n} \div 5 = 4$ (d) $\frac{24}{n} \div 4 = 6$

6. (a) $80 \div n = 10$ (b) $\frac{72}{n} \div 8 = 9$ (c) $40 \div n = 5$ (d) $\frac{27}{n} \div 9 = 3$

Missing divisors and dividends 247

Using the Book Work together with the students on Exercises 1-3. Encourage students to write the inverse equation for Exercises 4-6.

The answers for Exercises 1, 4(a), 4(b), and 4(c) are in the back of the text for those that need to check.

OBJECTIVE

To find missing dividends and missing divisors

PACING

Level A All

Level B All

Level C All

SUGGESTIONS

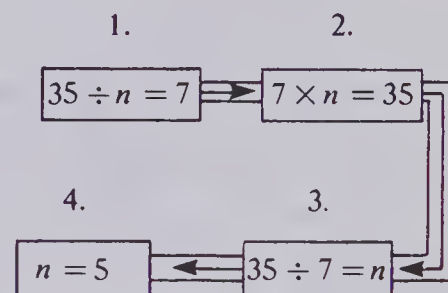
Initial Activity Review the terms involved in division.

Dividend	Divisor	Quotient
48	$\div 6$	$= 8$

Start the lesson by using the second example in the display (missing dividend) because it most obviously follows the rules for inverse operations. $n \div 6 = 8$ "What number contains 8 sets of 6?"

$8 \times 6 = n$ "8 sets of 6 equals what number?" (48)

The first example in the display (missing divisor) may cause pupils some difficulty at first sight. Students may insist that $35 \div n = 7$ should be rewritten as $7 \times n = 35$. While this is correct, encourage students to see that in the previous day's lesson $7 \times n = 35$ would have been rewritten as $35 \div 7 = n$. A complete machine diagram would look like this.



By mutual agreement, we can dispense with writing Step 2.

This might be an appropriate place to confirm the reason for rewriting equations. It is much easier to solve an equation when the "unknown quantity" is a missing product ($6 \times 7 = n$) or a missing quotient ($48 \div 6 = n$). When an equation contains a missing factor, dividend, or divisor, we rewrite to put that equation into an easier form.

ACTIVITIES

1. If you have not already done so, see the activities suggested for page 246. They can be used and/or modified for use here.

2. For further practice finding missing divisors and dividends, prepare some flip cards as shown. The cards are self-checking.

Front	Back
$12 \div n = 6$	$n = 2$
$28 \div n = 4$	$n = 7$
$36 \div n = 3$	$n = 12$
$14 \div n = 2$	$n = 7$

3. See "Deal a Number Sentence" in the Activity Reservoir.

OBJECTIVE

To solve mini-problems by writing appropriate open number sentences

PACING

- Level A All
- Level B All
- Level C All

SUGGESTIONS

Initial Activity Consider the use of concrete aids to introduce this lesson, e.g., boxes of cookies, biscuits, crackers, etc.

Pose a problem in a manner similar to the following.
"I have 3 boxes of cookies. I know that there are 36 cookies altogether. How many cookies are there in each box?"

Use the chalkboard to develop the appropriate open number sentence.

3

×

n

=

36

(Number of boxes)

×

(Number of cookies in each box)

=

(Number of cookies altogether)

Reminding students of the work done in the previous two lessons, encourage them to rewrite the open sentence in easier form,

$$36 \div 3 = n.$$

and then make the sentence true,

$$36 \div 3 = 12.$$

An alternate approach might be to demonstrate with a plain brown grocery bag labelled "The Mystery Bag".

Say	Write
I am pretending that there are 35 Tini-Toys in this bag.	35 Tini-Toys
I don't know how many boxes there are.	n boxes
I know that there are 7 Tini-Toys in each box.	7 in each box
How many boxes of Tini-Toys?	$35 \div n = 7$ (Open number sentence.) $35 \div 7 = n$ (Rewrite.) $35 \div 7 = 5$ (Make the sentence true.)

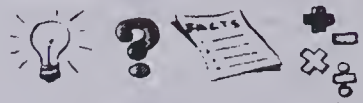
Toy Store

9 cartons of model airplanes.
There are n airplanes in each carton.
45 airplanes altogether.
How many airplanes in each case?



Step 1 Answer Professor Q's four questions mentally.

Step 2 Write an open number sentence.



9

×

n

=

45

Number of cartons

Number of airplanes in each carton

Number of airplanes altogether

Step 3 Rewrite to make the sentence easier.

$$45 \div 9 = n$$

Step 4 Make the sentence true.

$$45 \div 9 = 5$$



There are 5 model airplanes in each carton.

Exercises

Complete.

1. n cartons of puppets.
6 puppets in each carton.
18 puppets altogether.
How many cartons?

1. Professor Q
2. $n \times 6 = 18$
3. $18 \div 6 = n$
4. $18 \div 6 = ?$
There are ³? cartons.



Using the Book Read through the display together. If necessary write Professor Q's four questions on the chalkboard for easy reference. (Those 4 questions are stated on page 8.)

Work through Exercises 1 and 2 with the students, then assign Exercises 3-7 for individual seatwork. Stress upon the children to read carefully what is being asked (i.e., "How many in each carton? How many cartons?").

2. 24 sailboats.
 n sailboats in each box.
 4 boxes.
 How many sailboats in each box?

1. Professor Q
 2. $24 \div n = 4$
 3. $24 \div 4 = n$
 4. $24 \div 4 = ?$ 6



There are ⁶? sailboats in each box.

3. n racing cars.
 5 cars in each box.
 6 boxes.
 How many racing cars altogether?

1. Professor Q
 2. $n \div 5 = 6$
 3. $6 \times 5 = n$
 4. $6 \times 5 = ?$ 30



There are ³⁰? racing cars altogether.

Solve. Use the four steps to help you.

4. 7 cartons of "slinky dogs".
 n dogs in each carton.
 63 dogs altogether.
 How many slinky dogs in each carton? 9

5. n rockets.
 7 rockets in each box.
 8 boxes.
 How many rockets altogether? 56

6. 24 woodburning sets.
 n sets in each box.
 8 boxes.
 How many woodburning sets in each box? 3

7. n cartons of steam engines.
 6 engines in each carton.
 72 engines altogether.
 How many cartons of steam engines? 12

ACTIVITIES

1. Divide group into 2 or 3 teams. Continue with the Mystery-Bag activity suggested in the Initial Activity. Each correct response gets a point. Go through all players randomly. Team with the most points is the winner.

2. Some children may enjoy writing word problems (which can be used in Activity 1 above at a later date). For those who need it, apply a number sentence or facts and an idea to start them off (i.e., $60 \div 5 = 12$, eggs, cartons; 24, 3, 8, golf balls; 45, 5, 9, flowers, rows; etc.).

OBJECTIVE

To develop a rule, through the use of number patterns, for multiplication of a decimal by ten

PACING

- Level A 1-19
- Level B 1-5, 7-9, 11-19
- Level C 1-4, 7-8, 15-22

RELATED AIDS

CALC. W/BK — 18.

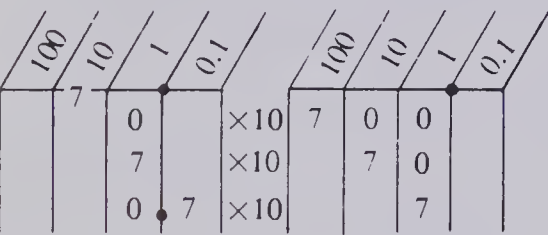
SUGGESTIONS

Initial Activity Use the display information at the top of the page or similar chalkboard examples to demonstrate the pattern. It is important to stress place value at this point. You might ask, "Why are the numbers in the examples written like this?"

70 280 3270
7 28 327
0.7 2.8 32.7

(They are written according to their place values. The decimal place shifts one place to the left each succeeding line.)

The products are also written according to their place values in an effort to emphasize the patterns. You might consider developing a chalkboard chart, particularly if students have difficulty in verbalizing their perceptions of the pattern.



Accept descriptions from students such as, "When I multiply by ten, the number moves to the next place-value column on the left." or "The decimal moves to the right one place when I multiply by 10."

In regards to a specific rule for multiplication of a decimal by ten, the preceding description could apply. Some students may wish to state the rule as: "When I multiply a decimal by ten, the decimal point moves one place to the right."

ACTIVITIES

1. Play "Concentration" as described in the Activity Reservoir. Use cards such as:
 475×10 ; 4750
 47.5×10 ; 475
 4750×10 ; 47 500
etc.

Number Patterns

Sandy uses number patterns to help her multiply decimals.

0.7×10	2.8×10	32.7×10
$70 \times 10 = 700$	$280 \times 10 = 2800$	$3270 \times 10 = 32\,700$
$7 \times 10 = 70$	$28 \times 10 = 280$	$327 \times 10 = 3\,270$
$0.7 \times 10 = 7$	$2.8 \times 10 = 28$	$32.7 \times 10 = 327$

Can you describe the pattern?

Make a rule to help you multiply a decimal by 10.

Move the decimal point
1 place to the right

Exercises

Complete these patterns.

- $50 \times 10 = 500$ ● $420 \times 10 = 4200$ 3. $2360 \times 10 = 23\,600$
 $5 \times 10 = \blacksquare 50$ $42 \times 10 = \blacksquare 420$ $236 \times 10 = \blacksquare 2360$
 $0.5 \times 10 = \blacksquare 5$ $4.2 \times 10 = \blacksquare 42$ $23.6 \times 10 = \blacksquare 236$
- 4. $730 \times 10 = \blacksquare 7300$ 5. $4750 \times 10 = \blacksquare 47\,500$ 6. $40 \times 10 = \blacksquare 400$
 $73 \times 10 = \blacksquare 730$ $475 \times 10 = \blacksquare 4750$ $4 \times 10 = \blacksquare 40$
 $7.3 \times 10 = \blacksquare 73$ $47.5 \times 10 = \blacksquare 475$ $0.4 \times 10 = \blacksquare 4$

Find each product. Use your rule.

- (a) $3 \times 10^3 = 30$ 8. (a) $325 \times 10^3 = 3250$ 9. (a) 57×10^{570} 10. (a) 8×10^{80}
(b) $0.3 \times 10^3 = 3$ (b) $32.5 \times 10^3 = 325$ (b) $5.7 \times 10^{57} = 57$ (b) $0.8 \times 10^8 = 8$
- $0.6 \times 10^6 = 6$ ● $2.5 \times 10^{25} = 25$ 13. $24.9 \times 10^{249} = 249$ 14. $0.2 \times 10^2 = 2$
- 15. $8.7 \times 10^{87} = 87$ 16. $9.8 \times 10^{98} = 98$ 17. $0.3 \times 10^3 = 3$ 18. $1.3 \times 10^{13} = 13$
- 19. $65.8 \times 10^{658} = 658$ 20. $21.1 \times 10^{211} = 211$ 21. $0.9 \times 10^9 = 9$ 22. $0.7 \times 10^7 = 7$

250 Multiplying a decimal by 10

Using the Book Read through the display together and have someone respond to the final question and instruction.

Encourage students to use their rules mentally as they work through the exercises.

2. If calculators are available, some children might enjoy exploring what happens as patterns continue, e.g., 3270×10 , 327×10 , 32.7×10 , 3.27×10 , 0.327×10 , etc.

3. Play "What's Happening?" as described in the Activity Reservoir. Be sure to include decimals (tenths) multiplied by 10 in the course of the game.

More Number Patterns

Sandy uses number patterns with division too!

$0.7 \div 10$	$2.8 \div 10$	$32.7 \div 10$
$70 \div 10 = 7$	$280 \div 10 = 28$	$3270 \div 10 = 327$
$7 \div 10 = 0.7$	$28 \div 10 = 2.8$	$327 \div 10 = 32.7$
$0.7 \div 10 = 0.07$	$2.8 \div 10 = 0.28$	$32.7 \div 10 = 3.27$

Can you describe the pattern? Move the decimal point 1 place to the left. If there is no digit in the one's place then put a 0 there.

Exercises

Complete these patterns.

1. $60 \div 10 = 6$
 $6 \div 10 = 0.6$
 $0.6 \div 10 = 0.06$
2. $350 \div 10 = 35$
 $35 \div 10 = 3.5$
 $3.5 \div 10 = 0.35$
3. $4350 \div 10 = 435$
 $435 \div 10 = 43.5$
 $43.5 \div 10 = 4.35$
4. $820 \div 10 = 82$
 $82 \div 10 = 8.2$
 $8.2 \div 10 = 0.82$
5. $40 \div 10 = 4$
 $4 \div 10 = 0.4$
 $0.4 \div 10 = 0.04$
6. $7950 \div 10 = 795$
 $795 \div 10 = 79.5$
 $79.5 \div 10 = 7.95$

Find each quotient.

7. $6 \div 10 = 0.6$
 8. $247 \div 10 = 24.7$
 9. $35 \div 10 = 3.5$
 10. $87 \div 10 = 8.7$
11. $0.6 \div 10 = 0.06$
 12. $24.7 \div 10 = 2.47$
 13. $3.5 \div 10 = 0.35$
 14. $8.7 \div 10 = 0.87$
15. $7 \div 10 = 0.7$
 16. $0.7 \div 10 = 0.07$
 17. $25.5 \div 10 = 2.55$
 18. $148.2 \div 10 = 14.82$
19. $0.9 \div 10 = 0.09$
 20. $1.6 \div 10 = 0.16$
 21. $14.7 \div 10 = 1.47$
 22. $28.2 \div 10 = 2.82$
23. $0.5 \div 10 = 0.05$
 24. $0.1 \div 10 = 0.01$
 25. $5.5 \div 10 = 0.55$
 26. $8.1 \div 10 = 0.81$

Dividing a decimal by 10 251

Using the Book Read through the display material together, noting patterns, relating it to the previous lesson. Have someone respond to the final display question and instruction.

OBJECTIVE

To develop a rule, through the use of patterns, for division of a decimal by ten

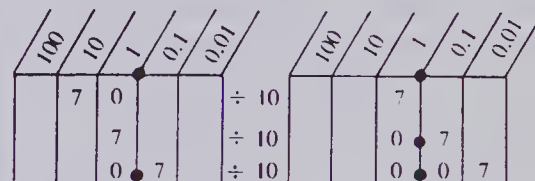
PACING

Level A 1-19
 Level B 1-5, 7-9, 11-19
 Level C 1-4, 7-8, 15-22

SUGGESTIONS

Initial Activity This lesson, like the previous one on page 250, depends on place value.

It would be beneficial to put the examples from the display on the chalkboard in chart form.



Student rules will vary.

"When I divide by ten, the number moves one place-value column to the right."

or

"When I divide by ten, the decimal point moves one place to the left."

ACTIVITIES

1. If you have not already done so, the activities described on page 250 can easily be modified for use here.

2. Play "Deal a Number Sentence" as described in the Activity Reservoir.

OBJECTIVE

To multiply a 2-digit factor by a 2-digit factor

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS — DM62.
BFA COMP LAB II — 37, 38.
BFA PROB. SOLVING LAB II — 77, 81, 180, 181, 221.
CALC. W/BK — 14-16.

SUGGESTIONS

Initial Activity Before starting this lesson, students would benefit from a quick drill of some basic multiplication facts in written and/or oral form. You might use two spinners with the numbers 1-9 to generate the factors.

Review also the steps involved in multiplication with regrouping as presented on pages 89 and 94.

ACTIVITIES

1. See the Fact Folder idea in the Activity Reservoir.

2. When the exercises have been completed and corrected, have children select an exercise or two, the name of a vegetable from the chalkboard list, and write a word problem of their own for inclusion in a classroom booklet or "problem box".

3. See the Picking Peaches idea in the Activity Reservoir.

Farmers' Market

43 boxes of cucumbers.
25 cucumbers in each box.
How many cucumbers altogether?

$$43 \times 25$$



Multiply ones.

$$\begin{array}{r} 43 \\ \times 25 \\ \hline 215 \end{array} \quad (5 \times 43)$$

Multiply tens.

$$\begin{array}{r} 43 \\ \times 25 \\ \hline 215 \\ 860 \end{array} \quad (20 \times 43)$$

Add.

$$\begin{array}{r} 43 \\ \times 25 \\ \hline 215 \\ 860 \\ \hline 1075 \end{array}$$

1075

There are cucumbers altogether.

Exercises

1. Complete.
$$\begin{array}{r} 57 \\ \times 36 \\ \hline \end{array}$$

Multiply ones.
$$\begin{array}{r} 57 \\ \times 36 \\ \hline 342 \end{array}$$

Multiply tens.
$$\begin{array}{r} 57 \\ \times 36 \\ \hline 1710 \\ 342 \end{array}$$

Add.
$$\begin{array}{r} 342 \\ + 1710 \\ \hline 2052 \end{array}$$

2. Complete.
$$\begin{array}{r} 63 \\ \times 35 \\ \hline \end{array}$$

Multiply ones.
$$\begin{array}{r} 63 \\ \times 35 \\ \hline 315 \end{array}$$

Multiply tens.
$$\begin{array}{r} 63 \\ \times 35 \\ \hline 1890 \\ 315 \end{array}$$

Add.
$$\begin{array}{r} 315 \\ + 1890 \\ \hline 2205 \end{array}$$

252 Multiplication 2 digits by 2 digits

Using the Book Work carefully with the students through the example in the display. Note that the examples do not indicate regrouping by placement of a digit above the upper factor.

Example

$$\begin{array}{r} 1 \\ 43 \\ \times 25 \\ \hline 215 \end{array} \quad (5 \times 43)$$

Encourage students to handle this process mentally.

Consider also the advisability of including the two factors in horizontal form beside each partial product, particularly when multiplying by tens. This reinforces the idea that, while for the purposes of the algorithm we are multiplying 2×43 , in reality we are multiplying 20×43 . In this sense multiplication depends not only on mastery of basic facts, but also on a strong awareness of place value.

Work together through Exercises 1 and 2, explaining and discussing each step. Exercises 3-7 have also been partially completed to help show the multiplication steps. You may need to complete some of these orally or on the chalkboard before assigning the exercises. Exercises 18-27 will have to be rearranged before they are computed. Be certain that the children are familiar with what constitutes an acceptable answer, with regard to Exercises 28-31.

Complete.

$\begin{array}{r} 48 \\ \times 24 \\ \hline 192 \\ 960 \\ \hline \end{array}$	$\begin{array}{r} 52 \\ \times 37 \\ \hline 364 \\ 1560 \\ \hline \end{array}$	$\begin{array}{r} 28 \\ \times 46 \\ \hline 168 \\ 1120 \\ \hline \end{array}$	$\begin{array}{r} 85 \\ \times 27 \\ \hline 595 \\ 1700 \\ \hline \end{array}$	$\begin{array}{r} 63 \\ \times 94 \\ \hline 252 \\ 5670 \\ \hline \end{array}$
1152	1924	1288	2295	5922

Multiply.

$\begin{array}{r} 43 \\ \times 38 \\ \hline 1634 \end{array}$	$\begin{array}{r} 63 \\ \times 26 \\ \hline 7638 \end{array}$	$\begin{array}{r} 49 \\ \times 33 \\ \hline 7617 \end{array}$	$\begin{array}{r} 45 \\ \times 36 \\ \hline 7620 \end{array}$	$\begin{array}{r} 52 \\ \times 13 \\ \hline 676 \end{array}$
$\begin{array}{r} 27 \\ \times 41 \\ \hline 1107 \end{array}$	$\begin{array}{r} 56 \\ \times 63 \\ \hline 3528 \end{array}$	$\begin{array}{r} 39 \\ \times 24 \\ \hline 936 \end{array}$	$\begin{array}{r} 46 \\ \times 17 \\ \hline 782 \end{array}$	$\begin{array}{r} 51 \\ \times 81 \\ \hline 4131 \end{array}$

18. $37 \times 24 = 888$ 19. $28 \times 18 = 504$ 20. $58 \times 42 = 2436$ 21. $34 \times 22 = 748$ 22. $62 \times 35 = 2170$

23. $41 \times 38 = 1558$ 24. $56 \times 11 = 616$ 25. $62 \times 72 = 4464$ 26. $89 \times 12 = 1068$ 27. $94 \times 89 = 8366$

Solve these mini-stories.

- | | |
|--|--|
| 28. 28 crates of turnips.
15 turnips in each crate.
How many turnips altogether? 420 | 29. 83 bunches of carrots.
12 carrots in each bunch.
How many carrots altogether? 996 |
| 30. 62 boxes of cabbages.
36 cabbages in each box.
How many cabbages altogether? 2232 | 31. 55 cartons of beans.
36 packages in each carton.
How many packages altogether? 1980 |

EXTRA PRACTICE

1. Multiply.

1. $\begin{array}{r} 37 \\ \times 51 \\ \hline \end{array}$	2. $\begin{array}{r} 26 \\ \times 16 \\ \hline \end{array}$	3. $\begin{array}{r} 87 \\ \times 53 \\ \hline \end{array}$
4. $\begin{array}{r} 43 \\ \times 78 \\ \hline \end{array}$	5. $\begin{array}{r} 59 \\ \times 84 \\ \hline \end{array}$	6. $\begin{array}{r} 68 \\ \times 43 \\ \hline \end{array}$
7. $\begin{array}{r} 72 \\ \times 29 \\ \hline \end{array}$	8. $\begin{array}{r} 63 \\ \times 47 \\ \hline \end{array}$	9. $\begin{array}{r} 55 \\ \times 44 \\ \hline \end{array}$
10. $\begin{array}{r} 27 \\ \times 33 \\ \hline \end{array}$	11. $\begin{array}{r} 49 \\ \times 31 \\ \hline \end{array}$	12. $\begin{array}{r} 65 \\ \times 47 \\ \hline \end{array}$
13. $\begin{array}{r} 84 \\ \times 21 \\ \hline \end{array}$	14. $\begin{array}{r} 20 \\ \times 30 \\ \hline \end{array}$	15. $\begin{array}{r} 93 \\ \times 39 \\ \hline \end{array}$

2. See HMS — DM62.

OBJECTIVE

To provide practice with division and multiplication by 1's, 10's, 100's, and 1000's

PACING

- Level A All
- Level B All
- Level C All

BACKGROUND

This page provides practice with skills necessary for estimation (page 255) and much of the division work on pages 258-262.

SUGGESTIONS

Initial Activity Review patterns similar to the samples below, before being assigned the tune-up page.

1. 5 × 10

5 × 100

5 × 1000
2. 6 × 10

60 × 10

600 × 10
3. 70 ÷ 10

700 ÷ 10

7000 ÷ 10
4. 3000 ÷ 1000

3000 ÷ 100

3000 ÷ 10
5. 8 ÷ 4

80 ÷ 4

800 ÷ 4
6. 2 × 3

2 × 30

2 × 300
7. 4 × 6

40 × 6

400 × 6
8. 30 × 5

30 × 50

30 × 500
9. 40 × 30

40 × 40

40 × 50

ACTIVITIES

1. See the Fact Folder in the Activity Reservoir.
2. Provide further challenges of the type illustrated in the Braintickler.

Tune Up

Multiply.

1. 35 × 10 350

2. 58 × 10 580

3. 68 × 10 680

4. 54 × 10 540
5. 13 × 100 1300

6. 83 × 100 8300

7. 68 × 100 6800

8. 49 × 100 4900
9. 47 × 1000 47 000

10. 34 × 1000 34 000

11. 29 × 1000 29 000

12. 87 × 1000 87 000

Divide.

13. 90 ÷ 10 9

14. 10 $\overline{)50}$ 5

15. 900 ÷ 10 90

16. 10 $\overline{)360}$ 36
17. 400 ÷ 100 4

18. 100 $\overline{)700}$ 7

19. 300 ÷ 100 3

20. 100 $\overline{)4500}$ 45
21. 6000 ÷ 1000 6

22. 1000 $\overline{)8000}$ 8

23. 2000 ÷ 1000 2

24. 1000 $\overline{)86 000}$ 86

Multiply.

25. 10 × 40 400

26. 100 × 20 2000

27. 1 × 60 60

28. 40 × 50 2000
29. 60 × 40 2400

30. 20 × 30 600

31. 30 × 50 1500

32. 1000 × 50 50 000

★ Solve these multiplication and division chains.

33. 45 × 10 = 1 = ■ 450

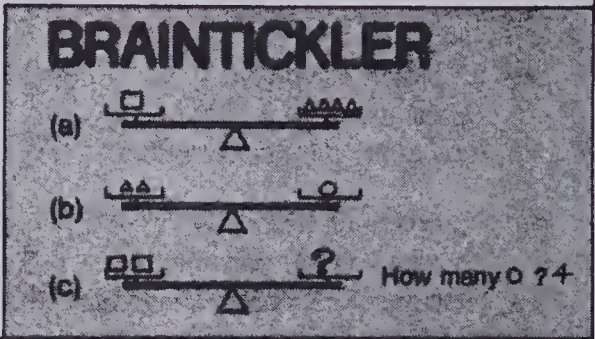
34. 100 × 5 = 10 = ■ 50

35. 5000 ÷ 100 × 10 = ■ 500

36. 100 × 64 = 10 = ■ 640

37. 36 × 1000 = 100 = ■ 360

38. 600 ÷ 20 × 10 = ■ 300



254 Multiplication and division practice

Using the Book Strongly encourage all students to calculate the answers *mentally*. Many pupils will have developed their own rules or "short cuts" to save time. Only the products or quotients need be recorded. Emphasize that in Exercises 33-38, the operations are to be done in the order they appear moving from left to right.

If significant numbers of students have difficulties, you may wish to reteach or provide more review. The following chart shows exactly where the topics were presented in this text.

Exercise	Topic	Page
1-4	Multiplication by 10	79-80
5-8	Multiplication by 100	79-80
9-12	Multiplication by 1000	79-80
13-16	Division of and by 10	115, 127
17-20	Division of and by 100	115, 127
21-24	Division of and by 1000	115, 127
25-32	Multiplication of and by powers of 10	80, 83
33-38	Multiplication and division of and by powers of 10	various (see above)

Estimation

Mr. and Mrs. Finley work together at the Farmers' Market.

37 cartons of tomatoes.

23 tomatoes in each carton.

How many tomatoes altogether?

Mr. Finley estimates:

He rounds off: 40×20
(to nearest 10)

He estimates: $40 \times 20 = 800$

There are *about* 800 tomatoes altogether.

$$37 \times 23$$

Mrs. Finley calculates:

She writes:

$$\begin{array}{r} 37 \\ \times 23 \\ \hline 111 \\ 740 \\ \hline 851 \end{array}$$

There are 851 tomatoes altogether.

The estimate tells us that Mrs. Finley's answer is reasonable.

Exercises

Estimate, then calculate.

1. 68×32

Estimate	Calculate
Think: 68×32	32
Round off: 70×30	$\times 68$
Estimate: $70 \times 30 = 2100$	256
	1920
	2176

$$\begin{array}{r} 84 \\ \times 29 \\ \hline 2436 \end{array}$$

$$\begin{array}{r} 34 \\ \times 28 \\ \hline 952 \end{array}$$

$$\begin{array}{r} 18 \\ \times 41 \\ \hline 738 \end{array}$$

5. 38×25

$$\begin{array}{r} 38 \\ \times 25 \\ \hline 950 \end{array}$$

6. 41×58

$$\begin{array}{r} 41 \\ \times 58 \\ \hline 2378 \end{array}$$

7. 27×33

$$\begin{array}{r} 27 \\ \times 33 \\ \hline 891 \end{array}$$

8. 18×18

$$\begin{array}{r} 324 \\ 18 \\ \times 18 \\ \hline 625 \end{array}$$

9. 64×34

$$\begin{array}{r} 2176 \\ 64 \\ \times 34 \\ \hline 846 \end{array}$$

10. 51×26

$$\begin{array}{r} 1326 \\ 51 \\ \times 26 \\ \hline 2356 \end{array}$$

11. 38×11

$$\begin{array}{r} 418 \\ 38 \\ \times 11 \\ \hline 475 \end{array}$$

12. 85×29

$$\begin{array}{r} 2465 \\ 85 \\ \times 29 \\ \hline 2925 \end{array}$$

13. 25×25

$$\begin{array}{r} 625 \\ 25 \\ \times 25 \\ \hline \end{array}$$

14. 47×18

$$\begin{array}{r} 846 \\ 47 \\ \times 18 \\ \hline \end{array}$$

15. 31×76

$$\begin{array}{r} 2356 \\ 31 \\ \times 76 \\ \hline \end{array}$$

16. 19×25

$$\begin{array}{r} 475 \\ 19 \\ \times 25 \\ \hline \end{array}$$

17. 75×39

$$\begin{array}{r} 2925 \\ 75 \\ \times 39 \\ \hline \end{array}$$

Estimating 255

Using the Book Read through the display, noting the points as outlined in the Initial Activity.

Assign the exercises. Be certain that the children know how to respond in their workbooks.

ACTIVITIES

1. Play "Ball Park" as described on page 93, Activity 2.

2. Prepare and distribute a matching exercise such as: Connect each step with a solid line.

Question	Rounded	Estimate
18×18	50×20	1500
47×21	80×30	400
63×11	90×50	2400
76×29	20×20	1000
52×34	60×10	4500
92×46	50×30	600

OBJECTIVE

To use estimation in order to judge whether or not a calculated product is reasonable

PACING

Level A All

Level B All

Level C All

RELATED AIDS

CALC. W/BK — 17.

SUGGESTIONS

Initial Activity Begin this lesson with a discussion about rounding and estimation. Encourage students to view estimation not as "extra work" but as a device which can help them judge whether or not the calculated product is reasonable. This attitude can be reinforced by suggesting that the estimates be calculated mentally. This points to a need for mastery of skills presented on the previous page (page 254).

Example

$$40 \times 20 = 800$$

Many students may wonder what constitutes a reasonable answer. You might consider using the example in the display to demonstrate.

(a) 37×23

Estimate: $40 \times 20 = 800$

My answer will be more than 800.

(b) 37×23

Estimate: $40 \times 30 = 1200$

My answer will be less than 1200.

Calculate:

$$\begin{array}{r} 37 \\ \times 23 \\ \hline 291 \\ 164 \\ \hline 1931 \end{array}$$

$$\begin{array}{r} 37 \\ \times 23 \\ \hline 111 \\ 74 \\ \hline 851 \end{array}$$

Better!

Something is wrong! Try again.

Emphasize that one written answer is reasonable while the other is not.

Example (b) can be used to demonstrate how estimation can also provide an "upper limit".

Example

"If I use the original factors (37×23) and round *both* of them up (40×30), I know that my written product cannot exceed 1200 ($40 \times 30 = 1200$). Yet my answer is 1931. Therefore I must check my calculations."

OBJECTIVE

To multiply a 3-digit factor by a 2-digit factor

PACING

Level A 1-21, 28-31

Level B 1-6, 8-19, 28-31

Level C 1-5, 8-9, 18-31

VOCABULARY

gravel, topsoil, limestone

RELATED AIDS

HMS — DM63.

BFA COMP LAB II — 41.

BFA PROB. SOLVING LAB II — 85, 88, 182, 183, 277.

CALC. W/BK — 14-16.

BACKGROUND

See the "Career Awareness" notes in the Chapter Overview (page 244). You may wish to use them as the basis for a discussion on the nature of a construction worker's job.

SUGGESTIONS

Initial Activity Begin by reviewing the 2-digit by 2-digit multiplication process as presented on page 252. Explain the steps and what the various numbers and stages mean. Then, use an example such as the one shown in the display to show 3-digit multiplication. Emphasize that the procedure is basically the same: multiply by ones, multiply by tens, add.

While not shown explicitly, you may want to develop estimation skills for this lesson.

Example

Estimate: $300 \times 20 = 6000$

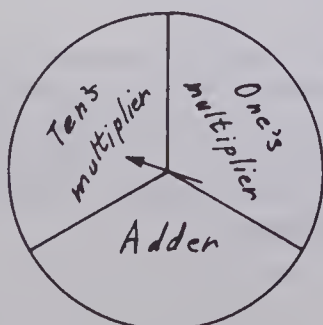
Calculate: $336 \times 24 = 8064$

Some students may require a brief review of the skill of rounding to the nearest 100 (pages 92, 233).

ACTIVITIES

1. See "The Fact Folder" as described in the Activity Reservoir.

2. Prepare (have the children help) 3-digit by 2-digit multiplication questions on slips of paper, a spinner (as shown), and divide the players into



Construction Worker

24 loads of steel pipe.

336 m of pipe in each load.

How many metres of pipe altogether?

$$24 \times 336$$

Multiply ones.

$$\begin{array}{r} 336 \\ \times 24 \\ \hline 1344 \end{array} \quad (4 \times 336)$$

Multiply tens.

$$\begin{array}{r} 336 \\ \times 24 \\ \hline 1344 \\ 6720 \end{array} \quad (20 \times 336)$$

Add.

$$\begin{array}{r} 336 \\ \times 24 \\ \hline 1344 \\ 6720 \\ \hline 8064 \end{array}$$

There are ⁸⁰⁶⁴ m of pipe altogether.

Exercises

1. Complete. 257×36

Multiply by the ones.

$$6 \times 257 = \boxed{1542}$$

$$\begin{array}{r} 257 \\ \times 36 \\ \hline 1542 \end{array}$$

Multiply by the tens.

$$30 \times 257 = \boxed{7710}$$

$$\begin{array}{r} 257 \\ \times 36 \\ \hline 1542 \\ 7710 \end{array}$$

Add.

$$1542 + 7710 = \boxed{9252}$$

$$\begin{array}{r} 257 \\ \times 36 \\ \hline 1542 \\ 7710 \\ \hline 9252 \end{array}$$

2. Complete. 316×25

Multiply by the ones.

$$5 \times 316 = \boxed{1580}$$

$$\begin{array}{r} 316 \\ \times 25 \\ \hline 1580 \end{array}$$

Multiply by the tens.

$$20 \times 316 = \boxed{6320}$$

$$\begin{array}{r} 316 \\ \times 25 \\ \hline 1580 \\ 6320 \end{array}$$

Add.

$$\boxed{1580} + \boxed{6320} = \boxed{7900}$$

$$\begin{array}{r} 316 \\ \times 25 \\ \hline 1580 \\ 6320 \\ \hline 7900 \end{array}$$

256 Multiplication 3 digits by 2 digits

Using the Book Read through the display together, discussing the various stages in the multiplication process. Have someone read the final statement supplying "8064" for the "■".

Complete Exercises 1 and 2 cooperatively, perhaps while someone is performing the calculations at the chalkboard.

Exercises 3-6 have been partially completed to help the children stay on the right track. Point out that each ■ in Exercises 3-7 should be replaced with not one numeral but a series of numbers. The long black boxes (i.e., ■) as shown in Exercises 1 and 2, were not used here because it was felt they would distract more than they would help.

Be certain that the children are familiar with the accepted answer format for Exercises 28-31.

Some children may find it helpful to use 0.5 cm squared paper in order to keep numbers in their correct vertical positions when doing multiplication.

Complete.

$\begin{array}{r} \bullet 473 \\ \times 42 \\ \hline 946 \\ 18920 \\ \hline 19866 \blacksquare \end{array}$	$\begin{array}{r} 4. 528 \\ \times 37 \\ \hline 3696 \\ 15840 \blacksquare \\ \hline 19536 \blacksquare \end{array}$	$\begin{array}{r} 5. 837 \\ \times 53 \\ \hline 2511 \blacksquare \\ 41850 \\ \hline 44361 \blacksquare \end{array}$	$\begin{array}{r} 6. 725 \\ \times 31 \\ \hline 725 \blacksquare \\ 21750 \blacksquare \\ \hline 22475 \end{array}$	$\begin{array}{r} 7. 682 \\ \times 46 \\ \hline 4092 \blacksquare \\ 27280 \blacksquare \\ \hline 31372 \blacksquare \end{array}$
$\begin{array}{r} \bullet 365 \\ \times 34 \\ \hline 12410 \\ 13520 \\ \hline 12425 \end{array}$	$\begin{array}{r} \bullet 298 \\ \times 43 \\ \hline 12814 \\ 11924 \\ \hline 12814 \end{array}$	$\begin{array}{r} \bullet 514 \\ \times 28 \\ \hline 14392 \\ 10868 \\ \hline 14392 \end{array}$	$\begin{array}{r} 11. 629 \\ \times 51 \\ \hline 32079 \\ 32079 \\ \hline 32079 \end{array}$	$\begin{array}{r} 12. 825 \\ \times 16 \\ \hline 13200 \\ 13200 \\ \hline 13200 \end{array}$
$\begin{array}{r} 13. 525 \\ \times 37 \\ \hline 19425 \\ 19425 \\ \hline 19425 \end{array}$	$\begin{array}{r} 14. 123 \\ \times 13 \\ \hline 1599 \\ 1599 \\ \hline 1599 \end{array}$	$\begin{array}{r} 15. 418 \\ \times 26 \\ \hline 10868 \\ 10868 \\ \hline 10868 \end{array}$	$\begin{array}{r} 16. 254 \\ \times 51 \\ \hline 12954 \\ 12954 \\ \hline 12954 \end{array}$	$\begin{array}{r} 17. 389 \\ \times 33 \\ \hline 12837 \\ 12837 \\ \hline 12837 \end{array}$
$\begin{array}{r} 18. 475 \\ \times 46 \\ \hline 21850 \\ 21850 \\ \hline 21850 \end{array}$	$\begin{array}{r} 19. 393 \\ \times 25 \\ \hline 9825 \\ 9825 \\ \hline 9825 \end{array}$	$\begin{array}{r} 20. 595 \\ \times 62 \\ \hline 36890 \\ 36890 \\ \hline 36890 \end{array}$	$\begin{array}{r} 21. 862 \\ \times 49 \\ \hline 42238 \\ 42238 \\ \hline 42238 \end{array}$	$\begin{array}{r} 22. 219 \\ \times 35 \\ \hline 7665 \\ 7665 \\ \hline 7665 \end{array}$
$\begin{array}{r} 23. 651 \\ \times 23 \\ \hline 4973 \\ 4973 \\ \hline 4973 \end{array}$	$\begin{array}{r} 24. 714 \\ \times 48 \\ \hline 34272 \\ 34272 \\ \hline 34272 \end{array}$	$\begin{array}{r} 25. 552 \\ \times 17 \\ \hline 9384 \\ 9384 \\ \hline 9384 \end{array}$	$\begin{array}{r} 26. 234 \\ \times 25 \\ \hline 5850 \\ 5850 \\ \hline 5850 \end{array}$	$\begin{array}{r} 27. 487 \\ \times 16 \\ \hline 7792 \\ 7792 \\ \hline 7792 \end{array}$

Solve these mini-stories about an engineer's work.

- | | |
|---|--|
| <p>28. 425 kg of sand in each load.
12 loads.
How many kilograms of sand altogether? <u>5100 kg</u></p> <p>30. 522 kg of gravel in each load.
15 loads.
How many kilograms of gravel altogether? <u>7830 kg</u></p> | <p>29. 14 loads of topsoil.
326 kg in each load.
How many kilograms of topsoil altogether? <u>4564 kg</u></p> <p>31. 25 loads of limestone.
483 kg in each load.
How many kilograms of limestone altogether? <u>12075 kg</u></p> |
|---|--|

groups of 3 to play "Rotate". First player selects a slip of paper and completes the first step, i.e., multiply by ones. Players then "rotate" roles by passing the paper to the player on the left who is responsible for the next step, i.e., multiplying by tens. After again rotating, the third player completes the last step — addition of partial products. First player then closes eyes and twirls spinner. The person who is indicated by the arrow wins the round and scores a number equal to the product. Round winners keep a cumulative total. Person with the highest total after 7 or 8 complete rotations is the overall winner.

3. See HMS — DM63.

EXTRA PRACTICE

- | | | |
|--|--|--|
| <p>1. $\begin{array}{r} 610 \\ \times 24 \\ \hline \end{array}$</p> <p>4. $\begin{array}{r} 808 \\ \times 36 \\ \hline \end{array}$</p> <p>7. $\begin{array}{r} 630 \\ \times 58 \\ \hline \end{array}$</p> <p>10. $\begin{array}{r} 547 \\ \times 68 \\ \hline \end{array}$</p> | <p>2. $\begin{array}{r} 407 \\ \times 18 \\ \hline \end{array}$</p> <p>5. $\begin{array}{r} 427 \\ \times 61 \\ \hline \end{array}$</p> <p>8. $\begin{array}{r} 194 \\ \times 73 \\ \hline \end{array}$</p> | <p>3. $\begin{array}{r} 630 \\ \times 24 \\ \hline \end{array}$</p> <p>6. $\begin{array}{r} 509 \\ \times 42 \\ \hline \end{array}$</p> <p>9. $\begin{array}{r} 209 \\ \times 89 \\ \hline \end{array}$</p> |
|--|--|--|

OBJECTIVE

To review division with a 1-digit divisor and a 2-digit quotient

PACING

Level A All
Level B All
Level C All

RELATED AIDS

BFA COMP LAB II — 50.

BACKGROUND

The display on this page provides a comparison of the long and short forms of the algorithm. It attempts, through this comparison, to demonstrate why the short form works. It is expected that most students will use the short form to complete the exercises.

SUGGESTIONS

Initial Activity Student success with division algorithms depends largely on the ability to:

1. estimate mentally;
2. multiply by 1, 10, and 100 (e.g., 4×10);
3. multiply a multiple of 10 by a 1-digit factor (e.g., 80×4);
4. subtract 2- and 3-digit numbers.

Provide sufficient practice in these four skills before introducing the lesson. You may want to spend part of one class period drilling areas of weakness.

If necessary, provide a brief review dealing with estimation procedures (i.e., "How do I get started?").

Example

$$\begin{array}{r} ? \\ 4 \overline{)214} \end{array}$$

"Which multiple of 10 should I use?"

- (a) $\begin{array}{r} 40 \\ 4 \overline{)214} \\ \underline{160} \end{array}$ (too few) (b) $\begin{array}{r} 50 \\ 4 \overline{)214} \\ \underline{200} \end{array}$ (Choose this one.) (c) $\begin{array}{r} 60 \\ 4 \overline{)214} \\ \underline{240} \end{array}$ (too many)

ACTIVITIES

1. Prepare (have the children help) a series of "fill in the box" activities of the type shown in Exercise 1. Substitute a \square for each \blacksquare .

Example

$$\begin{array}{r} 2\square R\square \\ 6 \overline{)163} \\ \underline{120} \\ 43 \\ \square\square \\ \square \end{array}$$

Division Review

Let's review the steps of the long and short forms.

Long Form

$214 \div 4$

Short Form

Step 1

$$\begin{array}{r} 50 \\ 4 \overline{)214} \\ \underline{200} \\ 14 \end{array}$$

Estimate 50.
Write 50.

Step 1

$$\begin{array}{r} 5 \\ 4 \overline{)214} \\ \underline{200} \\ 14 \end{array}$$

Estimate 50.
Write 5 in the ten's place.

Step 2

$$\begin{array}{r} 53 \\ 3 \\ 50 \\ 4 \overline{)214} \\ \underline{200} \\ 14 \\ 12 \\ \hline 2 R \end{array}$$

Estimate 3.
Write 3.

Step 2

$$\begin{array}{r} 53 R 2 \\ 4 \overline{)214} \\ \underline{200} \\ 14 \\ 12 \\ \hline 2 \end{array}$$

Estimate 3.
Write 3 in the one's place.
Show remainder.

Exercises

Divide. Some have remainders.

- | | | | | |
|---|---|--|---|--|
| 1. $\begin{array}{r} 27 R 1 \\ 6 \overline{)163} \\ \underline{120} \\ 43 \\ \blacksquare\blacksquare 42 \\ \blacksquare 1 \end{array}$ | 2. $\begin{array}{r} 42 \\ 3 \overline{)126} \end{array}$ | 3. $\begin{array}{r} 52 \\ 4 \overline{)208} \end{array}$ | 4. $\begin{array}{r} 36 R 3 \\ 5 \overline{)183} \end{array}$ | 5. $\begin{array}{r} 41 R 2 \\ 6 \overline{)248} \end{array}$ |
| 6. $\begin{array}{r} 27 \\ 5 \overline{)135} \end{array}$ | 7. $\begin{array}{r} 63 R 2 \\ 4 \overline{)254} \end{array}$ | 8. $\begin{array}{r} 71 R 2 \\ 3 \overline{)215} \end{array}$ | 9. $\begin{array}{r} 23 \\ 7 \overline{)161} \end{array}$ | 10. $\begin{array}{r} 34 R 2 \\ 6 \overline{)206} \end{array}$ |
| 11. $\begin{array}{r} 42 \\ 5 \overline{)210} \end{array}$ | 12. $\begin{array}{r} 35 \\ 8 \overline{)280} \end{array}$ | 13. $\begin{array}{r} 32 R 1 \\ 7 \overline{)225} \end{array}$ | | |

258 Review of division — 2-digit quotients

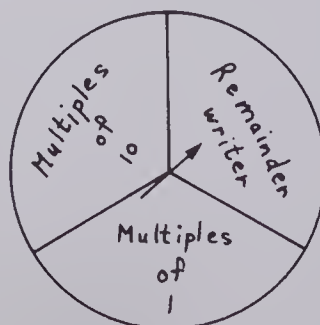
Using the Book Read through the display explaining that both forms yield the same quotient but that the "short form" as shown on the right panel of the display is easier and quicker.

Complete Exercise 1 cooperatively, having someone reveal the correct number for each \blacksquare .

The answers for Exercises 2-4 are at the back for those who need to check.

Some children may find it helpful to use 0.5 cm squared paper when doing the exercises on this page.

2. If the children enjoyed playing "Rotate", as described in Activity 2, on page 257, prepare materials keyed to playing for division. A suggested spinner is shown.



3. See "Quad-Row" as described in the Activity Reservoir.

EXTRA PRACTICE

- | | | |
|-------------------------|------------------------|------------------------|
| 1. $7 \overline{)238}$ | 2. $6 \overline{)324}$ | 3. $8 \overline{)168}$ |
| 4. $9 \overline{)135}$ | 5. $5 \overline{)125}$ | 6. $4 \overline{)392}$ |
| 7. $3 \overline{)267}$ | 8. $7 \overline{)196}$ | 9. $8 \overline{)312}$ |
| 10. $9 \overline{)891}$ | | |

Division and Multiples of 100

Work with John as he divides.

$$940 \div 4$$

Step 1



$$\begin{array}{r} 200 \\ 4 \overline{)940} \\ 800 \\ \hline 140 \end{array}$$

Which multiple of 100 did John use? 200

$$\begin{aligned} 4 \times 100 &= 400 \\ 4 \times 200 &= 800 \\ 4 \times 300 &= 1200 \end{aligned}$$

Step 2



$$\begin{array}{r} 30 \\ 200 \\ 4 \overline{)940} \\ 800 \\ \hline 140 \\ 120 \\ \hline 20 \end{array}$$

Which multiple of 10 did John use? 30

$$\begin{aligned} 4 \times 20 &= \blacksquare 80 \\ 4 \times 30 &= \blacksquare 120 \\ 4 \times 40 &= \blacksquare 160 \end{aligned}$$

Step 3

$$\begin{array}{r} 235 \\ 5 \\ 30 \\ 200 \\ 4 \overline{)940} \\ 800 \\ \hline 140 \\ 120 \\ \hline 20 \\ 20 \\ \hline 0 \end{array}$$

Which multiple of 1 did John use? 5

$$\begin{aligned} 4 \times 4 &= \blacksquare 16 \\ 4 \times 5 &= \blacksquare 20 \\ 4 \times 6 &= \blacksquare 24 \end{aligned}$$

Exercises

Tell which multiple of 100 is used to start each question.

$$\begin{array}{r} 200 \\ 3 \overline{)732} \\ 600 \\ \hline \end{array}$$

$$\begin{array}{r} \blacksquare \blacksquare \blacksquare \\ 7 \overline{)2387} \quad 300 \\ 2100 \\ \hline \end{array}$$

$$\begin{array}{r} \blacksquare \blacksquare \blacksquare \\ 4 \overline{)544} \quad 100 \\ 400 \\ \hline \end{array}$$

$$\begin{array}{r} \blacksquare \blacksquare \blacksquare \\ 6 \overline{)2526} \quad 400 \\ 2400 \\ \hline \end{array}$$

Decide which multiple of 100 to use, then complete the division.

$$\begin{array}{r} \blacksquare \\ 6 \overline{)744} \quad 100 \\ 532 \\ \hline \end{array}$$

$$\begin{array}{r} \blacksquare \\ 4 \overline{)1304} \quad 300 \\ 146 \\ \hline \end{array}$$

$$\begin{array}{r} \blacksquare \\ 3 \overline{)1263} \quad 400 \\ 4881 \\ \hline \end{array}$$

$$\begin{array}{r} \blacksquare \\ 5 \overline{)660} \quad 100 \\ 621 \\ \hline \end{array}$$

$$\begin{array}{r} 9. \quad 4 \overline{)2128} \quad 500 \\ 233 \\ \hline \end{array}$$

$$\begin{array}{r} 10. \quad 6 \overline{)876} \quad 100 \\ 15581 \\ \hline \end{array}$$

$$\begin{array}{r} 11. \quad 3 \overline{)145} \quad 0 \\ 141 \\ \hline \end{array}$$

$$\begin{array}{r} 12. \quad 4 \overline{)2484} \quad 600 \\ 319 \\ \hline \end{array}$$

$$\begin{array}{r} 13. \quad 5 \overline{)1165} \quad 200 \\ 221 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \quad 6 \overline{)931} \quad 100 \\ 236 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \quad 4 \overline{)564} \quad 100 \\ 451 \\ \hline \end{array}$$

$$\begin{array}{r} 16. \quad 6 \overline{)1914} \quad 300 \\ 253 \\ \hline \end{array}$$

$$\begin{array}{r} 17. \quad 7 \overline{)1547} \quad 200 \\ \hline \end{array}$$

$$\begin{array}{r} 18. \quad 8 \overline{)1888} \quad 200 \\ \hline \end{array}$$

$$\begin{array}{r} 19. \quad 9 \overline{)4059} \quad 400 \\ \hline \end{array}$$

$$\begin{array}{r} 20. \quad 7 \overline{)1771} \quad 200 \\ \hline \end{array}$$

OBJECTIVE

To divide using a 1-digit divisor and 3-digit quotient with the long form

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS — DM64.
BFA PROB. SOLVING LAB II —
99-101, 185, 186, 225, 226.

SUGGESTIONS

Initial Activity Review, if necessary, multiplication of a multiple of 100 by a 1-digit number.

Example

$$4 \times 300 \quad 6 \times 200 \quad 3 \times 500$$

ACTIVITIES

1. The activities suggested for page 258 can easily be adapted for use here.

2. Have the children generate their own division exercises for use in "The Fact Folder", "Picking Peaches", and other games in the Activity Reservoir. Provide, if necessary, 4 or 5 dice, one of which is the "divisor die" to randomize the process.

EXTRA PRACTICE

See HMS — DM64.

Using the Book Use a division example such as $696 \div 3$ and work with the students through the 3 steps as shown in the display, dealing with questions posed in each step.

Read through the display together emphasizing the same points that were covered in the Initial Activity.

Some students, as they work through the exercises, may inquire about the short form. At your discretion, you may want to direct them to page 260, where the forms are compared. Students who show an understanding of the short form could be allowed to finish their exercises using that form.

OBJECTIVE

To divide using a 1-digit divisor and 3-digit quotient with the short form

PACING

Level A 1-23

Level B 1-15, 21-25

Level C 1-4, 6-15, 26-30

RELATED AIDS

HMS — DM65.

BFA PROB. SOLVING LAB II — 74.

SUGGESTIONS

Initial Activity Many of your students should be ready to work with the shorter algorithm. Insofar as possible, students should understand that the "short cut" is based on their knowledge of place value. In other words, we need not include the zeros in the quotient because each nonzero digit retains its original value as a result of its place-value position.

4-- (Zero places can be left empty.)
 $7 \overline{) 3249}$
 $\underline{2800}$ (7×400) (The second factor is understood to be 400.)

Also:

45- (Zero place can be left empty.)
 $7 \overline{) 3249}$
 $\underline{2800}$
 $\underline{449}$
 $\underline{420}$ (7×60) (The second factor is understood to be 60.)

Use a number of chalkboard examples to ensure understanding before using the textbook.

ACTIVITIES

1. See the Fact Folder idea in the Activity Reservoir.

2. Provide 5 dice for children to generate their own division exercises for exchange with classmates. This will produce 3-digit quotients with remainders, which should pose little problem at this point.

3. Some children might enjoy producing "division puzzlers" (i.e., "fill in the blank" activities as exemplified by Exercises 3-5) from the results of Activity 2 above.

Comparing Division Forms

Let's compare the two forms!

$$741 \div 3$$

Long Form		Short Form	
Multiples of 100.			
Step 1 $\begin{array}{r} 200 \\ 3 \overline{) 741} \\ \underline{600} \\ 141 \end{array}$	Estimate 200. Write 200.	Step 1 $\begin{array}{r} 2 \\ 3 \overline{) 741} \\ \underline{600} \\ 141 \end{array}$	Estimate 200. Write 2 in the hundred's place.
Multiples of 10.			
Step 2 $\begin{array}{r} 40 \\ 200 \\ 3 \overline{) 741} \\ \underline{600} \\ 141 \\ \underline{120} \\ 21 \end{array}$	Estimate 40. Write 40.	Step 2 $\begin{array}{r} 24 \\ 3 \overline{) 741} \\ \underline{600} \\ 141 \\ \underline{120} \\ 21 \end{array}$	Estimate 40 Write 4 in the ten's place.
Multiples of 1.			
Step 3 $\begin{array}{r} 247 \\ 7 \\ 40 \\ 200 \\ 3 \overline{) 741} \\ \underline{600} \\ 141 \\ \underline{120} \\ 21 \\ \underline{21} \\ 0 \end{array}$	Estimate 7. Write 7.	Step 3 $\begin{array}{r} 247 \\ 3 \overline{) 741} \\ \underline{600} \\ 141 \\ \underline{120} \\ 21 \\ \underline{21} \\ 0 \end{array}$	Estimate 7. Write 7 in the one's place.

260 Division, introduction of short form

Using the Book Read through the display comparing the long and short forms as was done on page 258 and emphasizing the points outlined in your Initial Activity.

Exercises 1 and 2 offer a brief review of the place-value skills required to be successful with the division short form. Exercises 3-5 offer hints to help reinforce the division pattern. You may wish to complete some of these first 5 exercises orally before assigning any seatwork. The answers for Exercises 6, 7, and 8 are in the back of the pupil text for those who wish to check.

Exercises

- Look at the *short form* in the display. In each step, tell what multiple of 100, 10, or 1 is used. 200, 40, 7
- Tell what each digit means.
 - 2345
 - 5063
 - 74 030
 - 60 825

Copy and write the missing numbers in these short forms

$\begin{array}{r} 14 \square 2 \\ 4 \overline{) 568} \\ 400 \\ \hline 168 \\ 160 \\ \hline \square 8 \\ \square 8 \\ \hline \square 0 \end{array}$	$\begin{array}{r} 33 \\ 2 \square \square \\ 5 \overline{) 1265} \\ 1000 \\ \hline 265 \\ \square \square \square 250 \\ \hline \square \square 15 \\ \square \square 15 \\ \hline \square 0 \end{array}$	$\begin{array}{r} 4 3 \\ \square \square \square \\ 3 \overline{) 1239} \\ 1200 \\ \hline \square \square 39 \\ \square \square 30 \\ \hline \square 9 \\ \square 9 \\ \hline \square 0 \end{array}$
--	---	--

Divide using the short form.

$\begin{array}{r} 316 \\ 2 \overline{) 632} \end{array}$	$\begin{array}{r} 132 \\ 5 \overline{) 660} \end{array}$	$\begin{array}{r} 312 \\ 4 \overline{) 1248} \end{array}$	$\begin{array}{r} 141 \\ 6 \overline{) 846} \end{array}$	$\begin{array}{r} 132 \\ 7 \overline{) 924} \end{array}$
$\begin{array}{r} 423 \\ 4 \overline{) 1692} \end{array}$	$\begin{array}{r} 520 \\ 3 \overline{) 1560} \end{array}$	$\begin{array}{r} 342 \\ 7 \overline{) 2394} \end{array}$	$\begin{array}{r} 541 \\ 6 \overline{) 3246} \end{array}$	$\begin{array}{r} 341 \\ 3 \overline{) 1023} \end{array}$
$\begin{array}{r} 116 \\ 5 \overline{) 580} \end{array}$	$\begin{array}{r} 533 \\ 4 \overline{) 2132} \end{array}$	$\begin{array}{r} 121 \\ 8 \overline{) 968} \end{array}$	$\begin{array}{r} 723 \\ 6 \overline{) 4338} \end{array}$	$\begin{array}{r} 632 \\ 4 \overline{) 2528} \end{array}$
$\begin{array}{r} 633 \\ 5 \overline{) 3165} \end{array}$	$\begin{array}{r} 483 \\ 4 \overline{) 1932} \end{array}$	$\begin{array}{r} 918 \\ 3 \overline{) 2754} \end{array}$	$\begin{array}{r} 211 \\ 9 \overline{) 1899} \end{array}$	$\begin{array}{r} 333 \\ 8 \overline{) 2664} \end{array}$
$\begin{array}{r} 552 \\ 3 \overline{) 1656} \end{array}$	$\begin{array}{r} 265 \\ 4 \overline{) 1060} \end{array}$	$\begin{array}{r} 270 \\ 7 \overline{) 1890} \end{array}$	$\begin{array}{r} 354 \\ 6 \overline{) 2124} \end{array}$	$\begin{array}{r} 216 \\ 8 \overline{) 1728} \end{array}$

Division: short form: 3 digit quotients 261

ANSWERS

2. (a) 2 thousands, 3 hundreds, 4 tens, 5 ones (b) 5 thousands, 0 hundreds, 6 tens, 3 ones (c) 7 ten thousands, 4 thousands, 0 hundreds, 3 tens, 0 ones (d) 6 ten thousands, 0 thousands, 8 hundreds, 2 tens, 5 ones

EXTRA PRACTICE

- See HMS — DM65.
- Prepare and distribute a cross-number puzzle such as the following. (Answers are given.)

a	b	c		d
1	3	4		5
e			f	
6	8		4	2
		g		
2		3	0	
		h		i
		2	1	5
j	k			
3	1	4		2
l			m	
4	1		3	6

ACROSS

- a $4 \overline{) 536}$ e $7 \overline{) 476}$ f $5 \overline{) 210}$
 g $9 \overline{) 270}$ h $8 \overline{) 1720}$ j $6 \overline{) 1884}$
 l $9 \overline{) 369}$ m $6 \overline{) 216}$

DOWN

- a $5 \overline{) 810}$ b $4 \overline{) 152}$ d $7 \overline{) 364}$
 f $6 \overline{) 2406}$ g $5 \overline{) 1620}$ i $4 \overline{) 2104}$
 j $9 \overline{) 306}$ k $9 \overline{) 99}$

OBJECTIVE

To divide using a 1-digit divisor and 2- or 3-digit quotient with the short form

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activity Because the page contains varied practice for 2- and 3-digit quotients, you may want to provide some chalkboard examples which deal with the initial selection of an estimate (i.e., "How do I get started?").

Example

$$3 \overline{)138}$$

1. "Should I use multiples of 10 or 100?"

$$(a) \begin{array}{r} 10 \\ 3 \overline{)138} \\ \underline{30} \end{array}$$

(Choose this one.)

$$(b) \begin{array}{r} 100 \\ 3 \overline{)138} \\ \underline{300} \end{array}$$

(too many)

2. "Which multiple of 10 should I use?"

$$(a) \begin{array}{r} 30 \\ 3 \overline{)138} \\ \underline{90} \end{array}$$

(too few)

$$(b) \begin{array}{r} 40 \\ 3 \overline{)138} \\ \underline{120} \end{array}$$

(Choose this one.)

$$(c) \begin{array}{r} 50 \\ 3 \overline{)138} \\ \underline{150} \end{array}$$

(too many)

3. "Now I can begin!"

$$\begin{array}{r} 4 \\ 3 \overline{)138} \\ \underline{120} \\ 18 \end{array}$$

4. "... and complete the division."

$$\begin{array}{r} 46 \\ 3 \overline{)138} \\ \underline{120} \\ 18 \\ \underline{18} \\ 0 \end{array}$$

Note that Steps 1 and 2 are done mentally. Continued practice with multiplication using multiples of 10 and 100 is important (e.g., 5×30 , 8×200 , etc.).

ACTIVITIES

1. If you have not already done so, see

Making Decisions in Division

Michelle has discovered a method to help her make decisions in division!

$$4 \overline{)137}$$



Which
multiple?

Complete
the division.

STOP

Decide:

multiples of
10's or 100's?

$$\begin{array}{r} 10 \\ 4 \overline{)137} \\ \underline{40} \end{array}$$

Choose this one

$$\begin{array}{r} 100 \\ 4 \overline{)137} \\ \underline{400} \end{array}$$

Too large

Decide:

which multiple
of 10 (or 100)?

$$4 \times 20 = 80$$

$$4 \times 30 = 120$$

$$4 \times 40 = 160$$

Choose this one

Too large.

Complete the
division.

$$\begin{array}{r} 34 \text{ R } 1 \\ 4 \overline{)137} \\ \underline{120} \\ 17 \\ \underline{16} \\ 1 \end{array}$$

Exercises

Make decisions in these division questions.

$$\bullet \begin{array}{r} 43 \\ 3 \overline{)129} \end{array}$$

$$\bullet \begin{array}{r} 231 \\ 4 \overline{)924} \end{array}$$

$$\bullet \begin{array}{r} 35 \\ 6 \overline{)210} \end{array}$$

$$\bullet \begin{array}{r} 231 \\ 5 \overline{)1155} \end{array}$$

$$5. \begin{array}{r} 236 \\ 6 \overline{)1416} \end{array}$$

$$6. \begin{array}{r} 36 \\ 3 \overline{)108} \end{array}$$

$$7. \begin{array}{r} 213 \\ 7 \overline{)1491} \end{array}$$

$$8. \begin{array}{r} 23 \text{ R } 2 \\ 6 \overline{)140} \end{array}$$

$$9. \begin{array}{r} 214 \\ 4 \overline{)856} \end{array}$$

$$10. \begin{array}{r} 251 \\ 5 \overline{)1255} \end{array}$$

$$11. \begin{array}{r} 35 \text{ R } 2 \\ 4 \overline{)142} \end{array}$$

$$12. \begin{array}{r} 124 \text{ R } 1 \\ 3 \overline{)373} \end{array}$$

$$13. \begin{array}{r} 314 \\ 4 \overline{)1256} \end{array}$$

$$14. \begin{array}{r} 34 \\ 6 \overline{)204} \end{array}$$

$$15. \begin{array}{r} 34 \\ 8 \overline{)272} \end{array}$$

$$16. \begin{array}{r} 42 \text{ R } 2 \\ 4 \overline{)170} \end{array}$$

$$17. \begin{array}{r} 232 \\ 5 \overline{)1160} \end{array}$$

$$18. \begin{array}{r} 36 \text{ R } 3 \\ 7 \overline{)255} \end{array}$$

$$19. \begin{array}{r} 37 \\ 4 \overline{)148} \end{array}$$

$$20. \begin{array}{r} 263 \text{ R } 2 \\ 4 \overline{)1054} \end{array}$$

262 Practice with 2- and 3-digit quotients

Using the Book Review the "division decisions" as you read through the display together.

Assign the exercises.

the activities suggested for pages 260-261. They can be used here without modification.

2. Prepare and distribute this multiplication-division crossnumber puzzle.

	a		b	
	1	2	1	
c			d	e
7	9		5	3
f	1	0	4	6
	3			0
g	h		i	
2	5	1	3	0
j	5	4	k	3
	l	1	8	8

ACROSS

a $363 \div 3$

c 7.9×10

d $4 \overline{)212}$

f 327×32

g 5×5026

j $378 \div 7$

k $30 \div 1$

l $6 \overline{)1128}$

DOWN

a $5 \overline{)950}$

b 15.6×10

c 7925×9

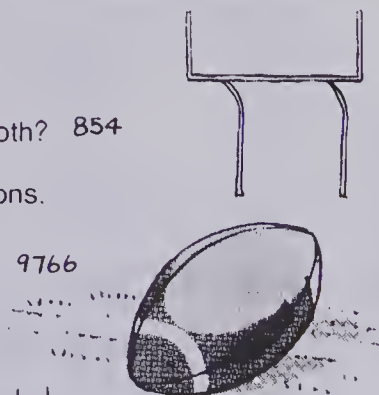
e 34×1000

h $4328 \div 8$

i $1690 \div 5$

Goodmore Stadium

1. The red section of Goodmore Stadium has 23 rows of seats.
Each row has 228 seats.
How many seats are there altogether in the red section? **5244**
2. There are 6 refreshment booths in the stadium.
A total of 5124 hot dogs were sold.
Each booth sold the same number.
What is the number of hot dogs sold by each booth? **854**
3. A parking lot near the stadium has 38 parking sections.
Each section holds 257 cars.
How many cars will the parking lot hold altogether? **9766**
4. The stadium secretary mailed tickets.
There are 8 tickets in each envelope.
How many envelopes were mailed? **Number of tickets mailed is not known.**
5. The stadium manager bought 2592 L of orange pop.
Eight coolers are filled.
How many litres of orange pop are there in each cooler? **324 L**
6. The seats in the green section of the stadium have to be painted.
There are 32 rows of seats.
There are 296 seats in each row.
How many seats will be painted? **9472**
- ★7. The stadium just received 565 new seats for the blue section.
There are 10 rows of seats.
How many seats will there be in each row? **56**
How many new seats will be left over? **5**



OBJECTIVE

To solve word problems using multiplication and/or division

PACING

Level A 1-6
Level B 1-6
Level C All

VOCABULARY

stadium, section, refreshment booths, secretary, envelope

RELATED AIDS

HMS — DM66.
CALC. W/BK — 27.

SUGGESTIONS

Initial Activity Review the problem-solving technique used in your class and/or see pages 8, 10, and 248. Stress the points, "What is being asked?" and "What should we do?", as you work through several examples similar to those on page 263.

Multiplication and division problems **263**

Using the Book If necessary, read through all problems together, noting any words with which the children may be unfamiliar (see Vocabulary above). Problem 7 involves being able to use 10 as a divisor.

ACTIVITIES

1. For those who need practice choosing the correct operation, prepare (or cut from old texts) a series of single-step multiplication and division word problems. Put these on cards and label two envelopes or other suitable containers with appropriate symbols (i.e., "×" and "÷"). Children must read a problem, decide the operation (not solve) and place it in its correctly-labelled container.
2. Expand Activity 1 above to include "+" and "-" word problems.
3. Use cards as shown to help

children write their own word problems. These may be used in a "problem box" or in Activities 1 and 2 above.

Make Word Problems.
Use this information.

1. spotlights 12
banks of lights 10
...
2. sections 50
seats altogether 5000
3. peanut sellers
15, 86
bags of peanuts

etc.

4. Students might enjoy collecting data about a stadium near the school or in a nearby city. Attendance figures, seating capacity and arrangements, construction and maintenance costs, etc., might be available from the stadium management or from the local Chamber of Commerce. The data, derived from a real-life situation, could be displayed on a bulletin board. Students might profit from designing their own problems based on the collected data and sharing them with classmates.

OBJECTIVE

To apply the divisibility rules for the numbers 2, 3, 4, 5, and 6

PACING

Level A Optional

Level B Optional

Level C Optional

RELATED AIDS

CALC. W/BK — 28.

ACTIVITIES

1. Reinforce basic division facts using "Marathon" as described in the Activity Reservoir.

2. Prepare sets of multiplication and division statements with their matching answers on separate cards. Place these in an envelope and have them sorted into their correct order.

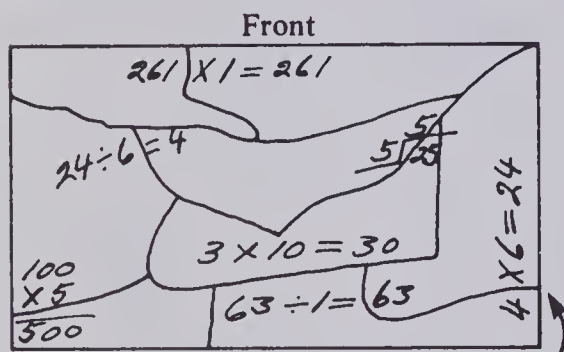
$$7 \times 9 = 63$$

$$63 \div 7 = 9$$

$$63 \div 9 = 7$$

etc.

3. Children might enjoy making their own multiplication and/or division picture puzzles using postcards or pictures cut from magazines and calendars.



Picture
glued
to
back.

Have them (a) select a picture, (b) cut a piece of blank paper to size, (c) write multiplication and division statements randomly across the paper, (d) glue to the flip side of the chosen picture, and (e) cut into pieces jigsaw fashion. Have them exchange with a classmate or contribute them to the Activity Centre. When puzzles are being assembled, have children use an appropriately-sized page of an open book as an assembly surface (what would be pages 348 and 349 of the Grade 4 pupil text

The Amazing Discovery of Professor Clark

Professor Clark discovered that 192 is divisible by 2, 3, 4, and 6 but not by 5!

$$\begin{array}{r} 96 \\ 2 \overline{)192} \\ \underline{18} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

$$\begin{array}{r} 64 \\ 3 \overline{)192} \\ \underline{18} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

$$\begin{array}{r} 48 \\ 4 \overline{)192} \\ \underline{16} \\ 32 \\ \underline{32} \\ 0 \end{array}$$

$$\begin{array}{r} 38 \\ 5 \overline{)192} \\ \underline{15} \\ 42 \\ \underline{40} \\ 2 \end{array}$$

$$\begin{array}{r} 32 \\ 6 \overline{)192} \\ \underline{18} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

Here are the secret rules!

A NUMBER IS DIVISIBLE BY		
TWO	if the digit in the unit's place is 0, 2, 4, 6, or 8.	Check 192
THREE	if the sum of its digits is divisible by 3.	$1 + 9 + 2 = 12$
FOUR	if the last two digits are divisible by 4	$92 \div 4 = 23$
FIVE	if it ends in 0 or 5.	192
SIX	if it's divisible by both 2 and 3.	divisible by both 2 and 3

97 is not divisible by 2, 3, 4, 5, or 6.

Use the secret rules on these numbers!

$256 \div 2, 4$
 $81 \div 2, 4, 5$
 $36 \div 2, 3, 4, 6$
 $27 \div 3$

$375 \div 3, 5$
 $126 \div 2, 3, 6$
 $18 \div 2, 3, 6$
 $50 \div 2, 5$

$111 \div 3$
 $108 \div 2, 3, 4, 6$
 $440 \div 2, 4, 5$
 $416 \div 2, 4$

256
 80
 36

375
 126
 18

50
 111
 108

440
 416

97

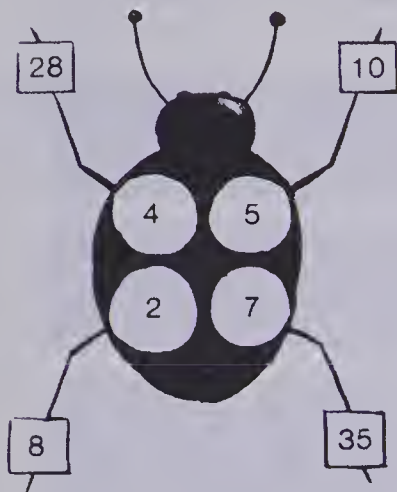
264 Rules for dividing by 2, 3, 4, 5, and 6

Using the Book This page is provided for those students who might enjoy investigating divisibility rules. You might encourage the better students to explore the secret rules while assigning drill on the activities for other students.

would be ideal). Children supply finished puzzle, close cover, flip book, and open cover to yield the assembled picture.

Multiplication Bugs

CHALLENGE: Make the front legs equal to the back legs!



Step 1 Choose any four numbers. Place them in the "body" of the bug (for example, 4, 5, 2, and 7).

Step 2 Multiply down. $4 \times 2 = 8$
 $5 \times 7 = 35$

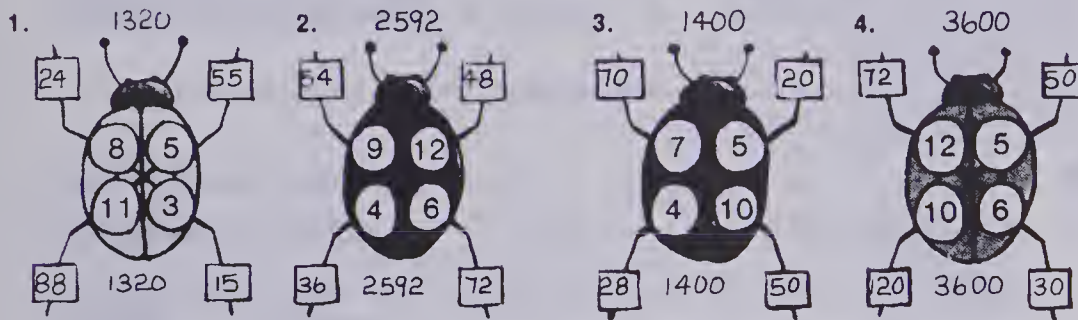
Step 3 Multiply diagonally. $7 \times 4 = 28$
 $2 \times 5 = 10$

Step 4 Multiply back legs. $8 \times 35 = 280$

Step 5 Multiply front legs. $28 \times 10 = 280$

Did you meet the challenge?

Try these multiplication bugs!



Make your own multiplication bugs!

OBJECTIVE

To provide basic multiplication drill

PACING

Level A Optional
Level B Optional
Level C Optional

VOCABULARY

diagonally

ACTIVITIES

1. Children might enjoy colouring completed bugs and assembling them for a possible bulletin-board display.

2. Some students might like to choose greater numbers (2- and 3-digit) and use a mini-calculator to obtain results.

All students could be challenged by exploring other possibilities.

Example

"Does the multiplication bug work when the four numbers used are:

- (a) even numbers
- (b) odd numbers
- (c) prime numbers
- (d) multiples of 3, 5, or 9?"

Using the Book This page is designed for those students who require further drill with multiplication, one of the important skills needed for the division algorithm. Read through the page together, being certain the step-by-step instructions are clear. You may wish to prepare a blank multiplication bug for distribution to the group. Note that the "bugs" are self-checking; that is, the product of the front legs should equal the product of the back legs.

OBJECTIVE

To review units of length

PACING

- Level A All
- Level B All
- Level C All

BACKGROUND

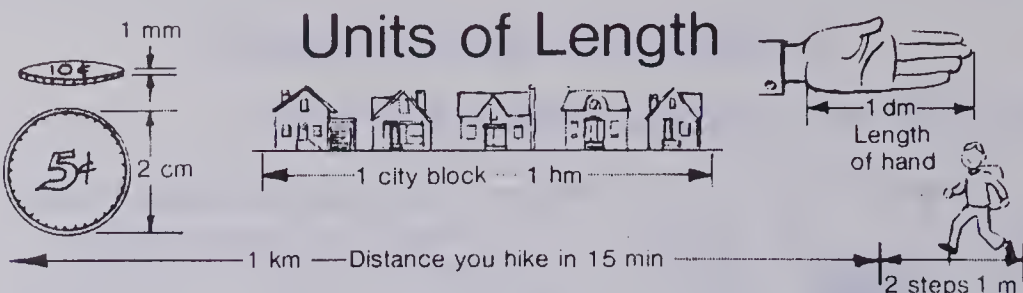
A measurement is made up of a number and a unit of measure; for example, the width of a hand may be 7 cm, the length of a pencil 1 dm, etc.

ACTIVITIES

1. Mark a 1 km running track on the school grounds and have students walk or run the distance. Students can be timed to help establish a feel for the distances.
2. Locate a point 1 hm and 1 km from the school so students can use these as reference points for the distances.
3. Prepare a set of cards each with the name of some length or distance in your school environment (choose lengths that students will be able to measure). The students are to estimate the length, then check their estimation by actual measurement. They then calculate:

my guess	20 cm
actual	<u>15 cm</u>
difference	5 cm

Units of Length




Exercises

Match.

● millimetre (i)	(a) a little more than the thickness of your pencil
● centimetre (a) and (d)	(b) about 1 city block
3. decimetre (h)	(c) length of two steps
4. metre (c) and (e)	(d) size of a marble
5. decametre (f)	(e) a little less than your height
6. hectometre (b)	(f) about the width of your classroom
7. kilometre (g)	(g) about how far you walk in 15 min
	(h) about the length of your hand
	(i) thickness of a dime

Name the unit you would use to measure each. Choose from: millimetre, centimetre, metre, kilometre.

● width of home plate	centimetre	9. length of a baseball bat	centimetre
10. from home plate to first base	metre	11. height of a baseball player	centimetre
12. how far you travelled in a car to a ball game	kilometre		
13. thickness of leather on baseball glove	millimetre		

Using the Book Discuss the units and provide the students with hands-on experiences using the millimetre, centimetre, decimetre, and metre.

Area

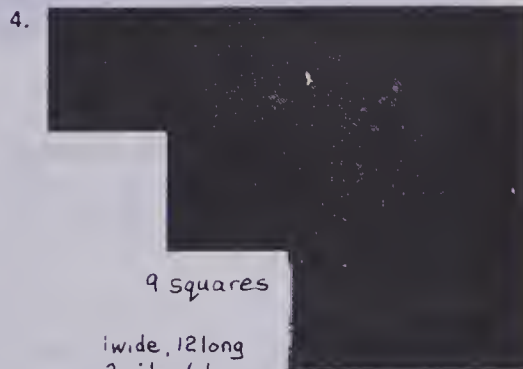
Trace and cut out 12 of these squares.
Cover each shape with your square units.
Record the number of squares used for each.
The area of each is the number of square units used.



Area is squares.
6



6 squares



9 squares

5. Make a rectangle using all 12 squares.
Record the number of units long and wide.
How many *different* rectangles can you make using all 12 squares? 6
Is the area of all the rectangles the same? yes

1 wide, 12 long
2 wide, 6 long
3 wide, 4 long
4 wide, 3 long
6 wide, 2 long
12 wide, 1 long

Here is one:



3 wide, 4 long

OBJECTIVE

To reinforce the concept of area using nonstandard units

PACING

Level A All
Level B All
Level C All

MATERIALS

paper, scissors

SUGGESTIONS

Initial Activity Establish the concept of area as the amount of surface space. The surface space can be measured using a variety of units: squares, blocks, hands, etc. Ask the students to cover their desks with standard-sized sheets of paper — do not overlap the pages. Ask: "What is the area of the desk top in sheets?" (Answers might be "Less than 8; more than 6; etc.")

Repeat for other surfaces in the class.

Area: nonstandard units 267

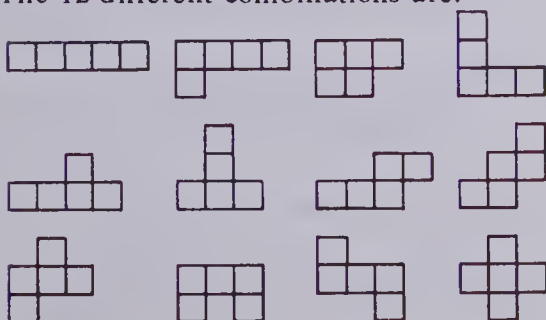
Using the Book Read through the instructions together being certain that all students know what to do. Provide paper and scissors.

In Exercise 5, students are to make rectangles using 12 of the given squares. Some students find it hard to realize that rectangles of different shapes can have the same area. This exercise should help resolve this conflict. Ask the students if they can make a large *square* using the 12 small squares. (Answer: they cannot)

ACTIVITIES

- Have the students make a set of pentaminoes as illustrated. Challenge the students to use all the pieces to make
 - a square,
 - a rectangle not a square.

The 12 different combinations are:



After making and introducing the game in class, allow the students to play it in their free time.

- Use 16 squares and repeat Exercise 5. As an extension project ask students to use:

- 2 squares
- 3 squares
- 4 squares

•
•
•

16 squares
and record the number of different rectangles. Those numbers making only one rectangle are *prime numbers* and those making more than one are *composite numbers*.

- Ask each student to make 10 copies of a hand print. Then ask them to find how many hand prints are necessary to cover a sheet of paper that you give them (about 15 cm × 20 cm). Discuss whether or not all students get the same answer. Why is this not a good unit for area measurement? (Answer: hand sizes differ and also they do not "fill" the space.)

- Provide the students with sets of circles and repeat Activity 3.

OBJECTIVE

To use the square centimetre as a standard unit of measure

PACING

Level A All
Level B All
Level C All

MATERIALS

paper, scissors, (or centimetre squares)

RELATED AIDS

HMS — DM67 and DM68.

SUGGESTIONS

Initial Activity Have the students measure and cut out a square 1 cm \times 1 cm. Elicit from the students that each side is 1 cm long. Explain that squares cover a surface without leaving spaces as do hand prints and circles (see Activities 2 and 3, page 267).

ACTIVITIES

1. Have students make a shape on their geo-boards, then switch with other students.

2. Make up a set of cards each with a shape drawn on it. The students are to use centimetre squares to find the area of each shape. (Answer may be written on the back for self-checking.)

3. Make up a set of cards made from dot paper. See DM67. Each has a shape drawn on it similar to Exercise 5. Students are to calculate the area.

(Answers may be written on the back for self-checking.)

4. See DM68.

The Square Centimetre



One square centimetre
 1 cm^2



One half square centimetre
 0.5 cm^2

A square centimetre is a unit used to measure area.

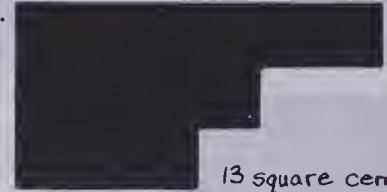
Exercises

Use square centimetres. Cover each shape. Record the area of each.



Area is \blacksquare square centimetres.
18

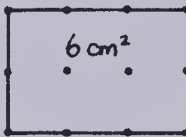
2.



13 square centimetres

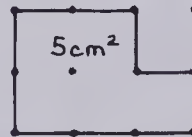
These shapes were made on a geo-board. What is the area of each?

3.



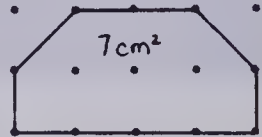
6 cm^2

4.



5 cm^2

5.



7 cm^2

John spilled paint on his rectangles. Find the area of each rectangle.

6.



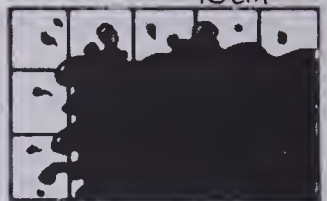
8 cm^2

7.



9 cm^2

8.



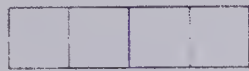
15 cm^2

268 Area square centimetre

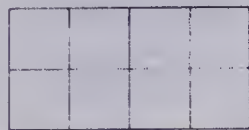
Using the Book The square centimetre is one unit that can be used to find area. Emphasize (a) the symbol for square centimetre (cm^2) and (b) that a square centimetre is a unit of area and need not be square in shape.

For shapes on a geo-board in Exercises 3-5, provide geo-boards or have students picture the squares in their minds and count them. Some students may use the method: 1 row has 5 squares, 3 rows have 15 squares. Others will use the short cut in the next lesson (3×5). Discuss each method presented by students and ask why it works.

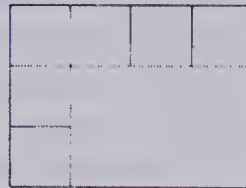
Short Cut to Area



1 row — 4 cm²



2 rows
4 × 2
8 cm²

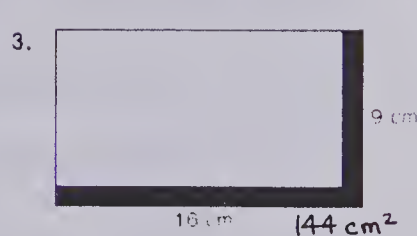
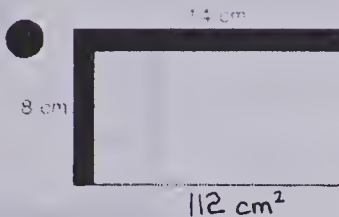
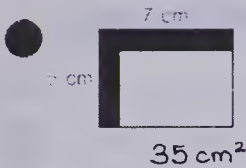


3 rows
4 × 3
12 cm²

Area of a rectangle: number of squares in 1 row multiplied by number of rows.

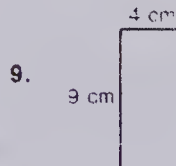
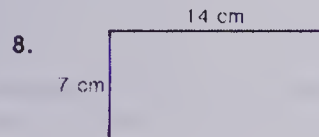
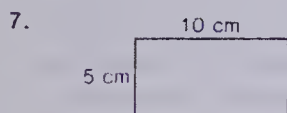
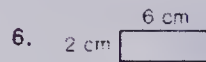
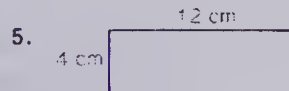
Exercises

Calculate the area of each rectangle.



We do not need to show the squares in one row. For each

- (a) how many centimetre squares in one row?
(b) how many rows? (c) what is the area?



Area short cut 269

OBJECTIVE

To formalize a method of finding the area of a rectangle as the "number of square units in one row times the number of rows"

PACING

Level A All
Level B All
Level C 3-9

RELATED AIDS

HMS — DM68.

SUGGESTIONS

Initial Activity Do not force the "formula" for area too quickly. See Using the Book for different ways of finding area. On the board, put a diagram of a 4 cm × 6 cm rectangle and label it. Ask the students to identify the number of squares on each side and then mark them, extending each mark from side to side and top to bottom so the diagram shows 24 squares.

Using the Book Discuss the display and the short cut (rule) for finding area. Assign the exercises. Have the students "show their work" for Exercises 4-9.

ANSWERS

4. (a) 8 (b) 3 (c) 24 cm² 5. (a) 12 (b) 4 (c) 48 cm² 6. (a) 6 (b) 2 (c) 12 cm²
7. (a) 10 (b) 5 (c) 50 cm² 8. (a) 14 (b) 7 (c) 98 cm² 9. (a) 4 (b) 9 (c) 36 cm²

ACTIVITIES

Prepare Activity Cards such as these for the students to work at in pairs.

1. Use the geo-board and elastics.

First person: makes a rectangle (e.g., 3 units × 7 units).

Second person: calculates the area of the rectangle.

Players take turns giving each other a rectangle.

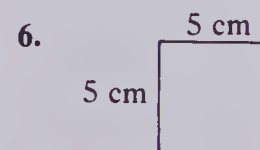
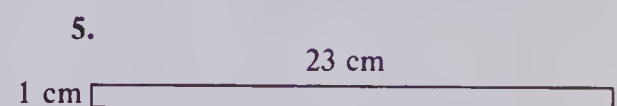
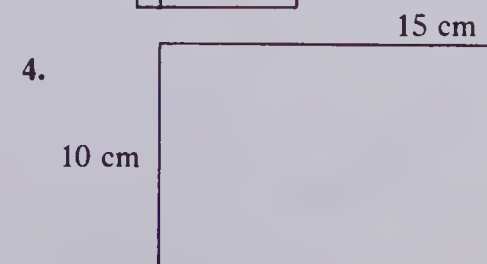
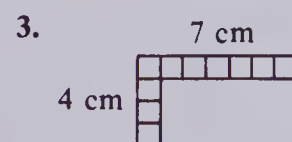
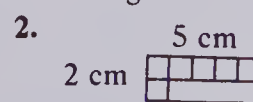
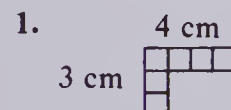
2. Use square centimetres to find the area of each face of this box. (Attach this card to a cornflakes or similar box.)

3. Challenge: What is the area of the chalkboard?

4. If you have not already done so, see DM68.

EXTRA PRACTICE

Find the area of each rectangle.



OBJECTIVE

To solve problems involving the area concept

PACING

Level A 1-4

Level B 1-4

Level C 1, 3-6

VOCABULARY

remodelling, rumpus room, ceramic

MATERIALS

pictures of tiles: tiled floors, tiled walls, tiled ceilings, etc.

SUGGESTIONS

Initial Activity Discuss renovating a rumpus room. What is necessary? What mathematics skills are used? Direct discussion to tiling the ceiling, floor, etc.

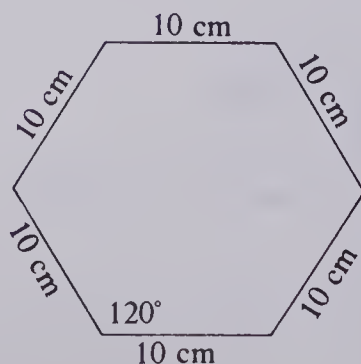
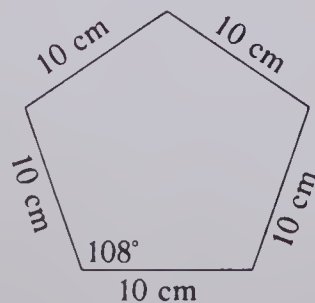
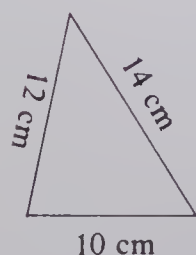
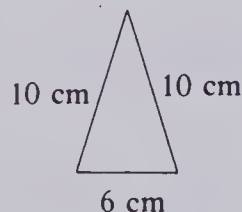
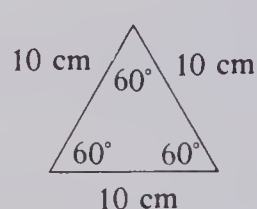
If your classroom has a tiled ceiling or floor, calculate the number of tiles using the method shown on page 269.

ACTIVITIES

1. Have the students use a geo-board and elastic bands to make rectangles. Have them find the area of each rectangle by counting squares in one row and the number of rows. Students can check their answers by counting each square.

2. Give students one half a square tile cut on the diagonal and a rectangle. Have them count the number of tiles required to cover the rectangle and then have them find the area of the rectangle.

3. Have students work in pairs to prepare envelope sets of each of these shapes: Ask: "Which of these shapes cover a space without having holes?" (Suggested sizes are given.)



Tiles, Tiles, Tiles

Marty's parents were remodelling the rumpus room. They put square tiles of different kinds in different places.

1. His Mother placed squares along one side of the rumpus room floor.

His Father put tiles along the other side. How many tiles are necessary to cover the floor? 84

2. Marty's Father placed tiles on the bathroom wall as shown.

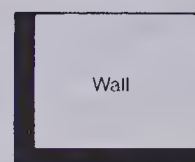
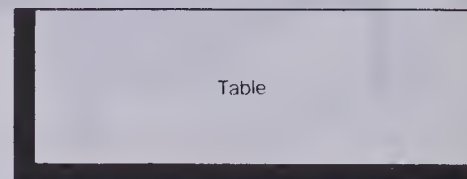
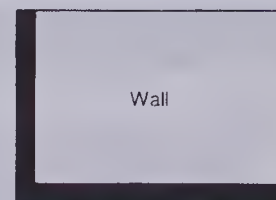
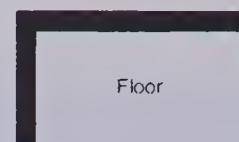
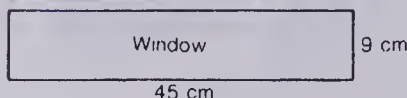
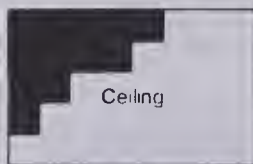
How many tiles are needed to cover the wall? 140

3. Marty's Mother put ceramic tiles on the coffee table.

How many tiles were needed to cover the table? 216

4. Square wood tiles were placed on one wall.

How many tiles were needed? 80



- ★ 5. The ceiling was partly tiled. 28
How many more tiles are needed?

- ★ 6. A small window needs new glass. How many square centimetres of glass are needed? 405 cm²

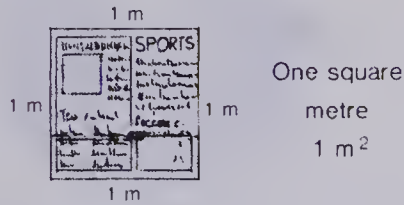
270 Area problems: tiling

Using the Book Read through the word problems together for those students who have reading difficulties. The pictures help the student get the main ideas.

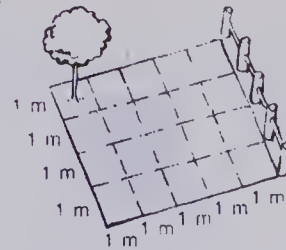
Emphasize the method: 1 row has ____ tiles; ____ rows have ____ tiles. Be certain children know how to respond in their workbooks.

The Square Metre

The **square metre** is a unit used to measure larger areas.



Use newspapers to make a square metre.



Lawn areas are measured in square metres.

OBJECTIVE

To introduce the square metre as a standard unit of area

PACING

Level A 1-4

Level B All

Level C All

MATERIALS

metre stick, newspapers

SUGGESTIONS

Initial Activity Discuss the square centimetre as a unit of area measure and then ask the students if it would be convenient to use the square centimetre to find the area of a football field, a playground, the classroom floor, etc.

Have students work in pairs to make square metres using old newspapers.

ACTIVITIES

1. Calculate the area of some appropriately shaped and sized areas in the school such as the classroom, hall, windows, etc.

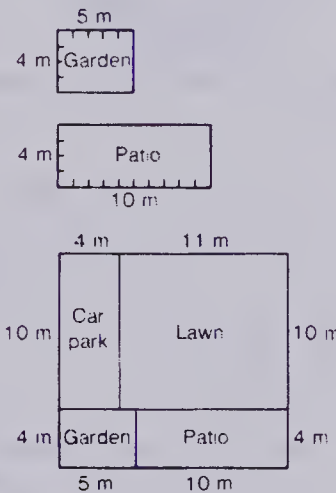
2. Ask the student to find as many patterns as he/she can in the magic square. What is the magic sum?

Exercises

- Use your square metres to measure the space in the hall outside your classroom.

Eileen and her parents planned the backyard of their new home.

- Eileen wanted a small garden. She measured the rectangular space shown. How many square metres in one row? 5 m^2
How many rows of square metres? 4
How many square metres in the garden? 20 m^2
- Eileen's Mother measured the patio. How many square metres in the patio? 40 m^2
- The lawn is 10 m wide and 11 m long. What is the area of the lawn? 110 m^2
- Eileen's Father paved the car park area. How many square metres of paving? 40 m^2



Area square metre 271

Using the Book Have students work in groups to do Exercise 1, which helps develop a mental image of area and a square metre. For the other exercises emphasize the method: 1 row has ____ square metres; ____ rows have ____ square metres.

(a)	6616	1111	6166	1661
	6161	1666	6611	1116
	1611	6116	1161	6666
	1166	6661	1616	6111
(b)	3323	2222	3233	2332
	3232	2333	3322	2223
	2322	3223	2232	3333
	2233	3332	2323	3222

3. See "Regatta" as described in the Activity Reservoir.

EXTRA PRACTICE

Copy and complete the chart. Sketch a diagram of each situation to aid in finding the area.

Length	Width	Area
12 m	8 m	
15 m	4 m	
6 m	11 m	
20 m	3 m	
9 m	9 m	

OBJECTIVE

To estimate the area of rectangular areas

PACING

Level A 1-10

Level B 1-10

Level C All

MATERIALS

ruler, tape, square centimetres (see DM76), square metres

RELATED AIDS

HMS — DM76.

SUGGESTIONS

Initial Activity Introduce the idea of estimation: an intelligent guess requiring (a) the unit of measure be firmly fixed in the mind, (b) the size of the unit relative to familiar objects be in the mind, and (c) a commitment to estimate so that the answer is reasonable.

Provide students with a ruler, tape, or square units and ask them to find objects of a given size as in Exercises 1-6.

ACTIVITIES

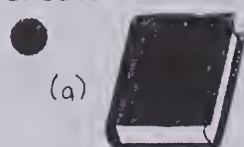
1. Have students find five shapes that would be measured in square centimetres and square metres and estimate the area of each. Then measure each object and find the actual area.

2. Have students find five shapes that would be measured in square metres and estimate the area of each. Then measure each object and find the actual area.

3. Ask students to name three shapes with an area of about 100 cm^2 , 10 m^2 , 50 cm^2 , 2 m^2 , etc.

Estimating Area

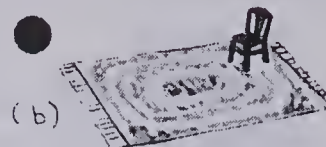
Choose the best area



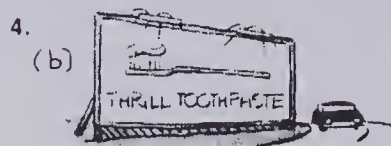
- (a) 400 cm^2
(b) 400 m^2
(c) 40 cm^2



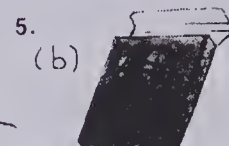
- (a) 400 cm^2
(b) 400 m^2
(c) 4 m^2



- (a) 12 cm^2
(b) 12 m^2
(c) 1 m^2



- (a) 30 cm^2
(b) 30 m
(c) 3 m

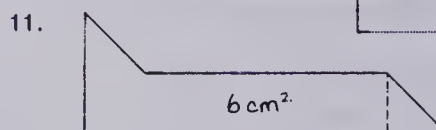
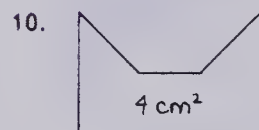
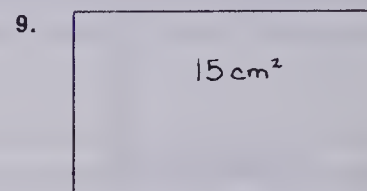
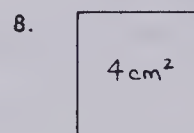
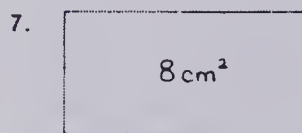


- (a) 8 cm^2
(b) 80 cm^2
(c) 800 cm^2



- (a) 12 cm^2
(b) 120 cm^2
(c) 1200 cm^2

Estimate the area of each shape in square centimetres.



- ★12. Guess the area in square metres of the floor of your classroom. Use your newspaper square metres to check your guess.

272 Estimating Area

Using the Book It is easier for students to estimate when they have the unit of measurement at hand. Therefore keep square centimetres and square metres available for the class.

Point out to the students that, for Exercises 1-6, they should choose what the best area would be *in real life*, for the items pictured.

For Exercises 7-11, they should estimate the area of the shapes as they appear on the page.

The answers for Exercises 1-3 are in the back of the book for those who need to check.

Tri-Wheels

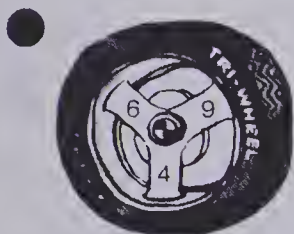


What is the product of this tri-wheel?

$$\begin{aligned} &7 \times 12 \times 4 \\ &= 84 \times 4 \\ &= 336 \end{aligned}$$

Exercises

Find the products for these tri-wheels.



$$6 \times 9 \times 4 = 216$$



$$12 \times 3 \times 8 = 288$$



$$15 \times 10 \times 11 = 1650$$

Find the products.

- | | | |
|--------------------------------------|-------------------------------------|--------------------------------------|
| 1. $7 \times 15 \times 12 = 1260$ | 2. $8 \times 13 \times 20 = 2080$ | 3. $18 \times 25 \times 10 = 4500$ |
| 4. $3 \times 9 \times 7 = 189$ | 5. $24 \times 15 \times 17 = 6120$ | 6. $19 \times 5 \times 23 = 2185$ |
| 7. $9 \times 25 \times 10 = 2250$ | 8. $5 \times 5 \times 30 = 750$ | 9. $14 \times 15 \times 16 = 3360$ |
| 10. $8 \times 10 \times 12 = 960$ | 11. $26 \times 4 \times 18 = 1872$ | 12. $10 \times 20 \times 30 = 6000$ |
| 13. $14 \times 17 \times 21 = 4998$ | 14. $11 \times 25 \times 19 = 5225$ | 15. $20 \times 30 \times 40 = 24000$ |
| 16. $24 \times 22 \times 28 = 14784$ | 17. $17 \times 11 \times 26 = 4862$ | 18. $15 \times 10 \times 20 = 3000$ |

Make your own tri-wheels and exchange with a friend.

OBJECTIVE

To find products using three factors

PACING

Level A 1-15
Level B 1-8, 10-18
Level C 1-6, 13-21

SUGGESTIONS

Initial Activity Review the grouping principle for multiplication (page 82). Give the students three questions of the type: $2 \times 3 \times 5 = \underline{\quad}$; $5 \times 3 \times 2 = \underline{\quad}$; $3 \times 2 \times 5 = \underline{\quad}$. Discuss the reason for all answers being the same.

Remind the students they can group any way they wish — convenience, speed, or ease of performance are usually the deciding factors.

ACTIVITIES

1. Let the students play "Concentration" as described in the Activity Reservoir. Make one set of cards with 3-factor questions on them ($4 \times 3 \times 6$, $5 \times 11 \times 2$, etc.), and another set of cards with partial products on them (12×6 , 4×18 , 72 , 55×2 , etc.).

2. Draw several lines on the chalkboard with white chalk. Then, using coloured chalk, colour over a section of each line. Then give this Activity Card to the students.

1. Measure the whole length of a line on the chalkboard.
2. Then measure its coloured section.
3. Figure out how long the white section is.
4. Measure the white section to discover whether or not you were right.
5. Do the same things for each of the other lines.

Using the Book Assign the exercises. If you let students use mini-calculators for some of the exercises have them do each, using two or three different groupings.

OBJECTIVES

To develop the meaning of volume
To use nonstandard units of volume

PACING

- Level A All
- Level B All
- Level C All

MATERIALS

blocks (all the same size), boxes into which the blocks will "fit"

SUGGESTIONS

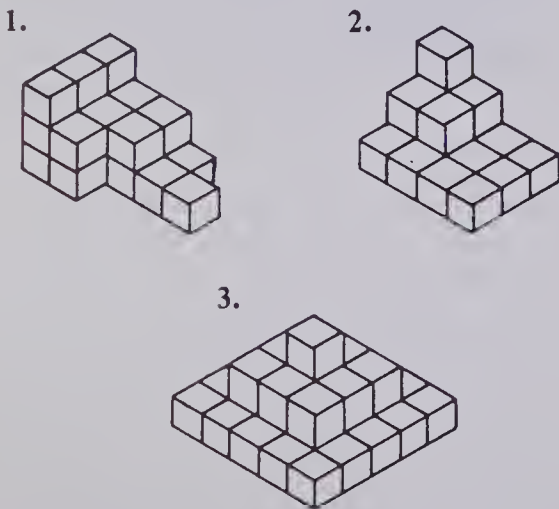
Initial Activity Develop the idea of volume by using blocks to fill boxes and build different shapes.
Give each student a set of 12 blocks and ask each to make as many different rectangular prisms as possible. Record the sizes: 2 high, 2 wide, 3 long; volume is 12. Note that the volume of each shape is 12 cubic units (conservation).

ACTIVITIES

1. Have students work in pairs. Students take turns building any shapes with a given number of blocks. The other student must tell how many blocks are in the shapes.
2. Give the students 12 blocks. Ask how many different shapes they can make using the 12 blocks. Ask if the volume of the shape changes with the shape? (no) Repeat for other numbers of blocks: 8, 16, 20, etc.

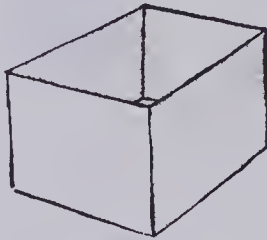
EXTRA PRACTICE

How many cubic units in each?

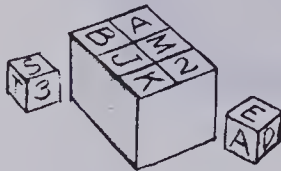


Volume

The amount of space inside this box is the **volume** of the box.




Jamey placed his little brother's blocks inside a box. Each block is 1 **cubic unit**.




The *volume* of the box is 12 *cubic units*.

Exercises

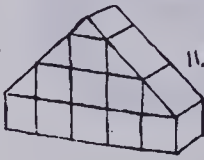
How many cubic units in each?



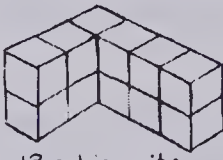
6 cubic units



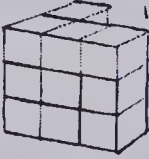
12 cubic units



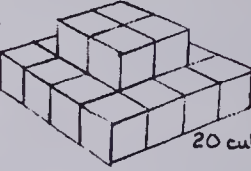
11.5 cubic units



12 cubic units

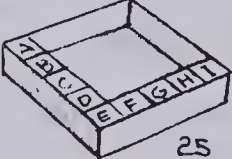


12 cubic units

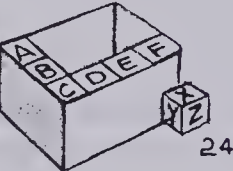


20 cubic units

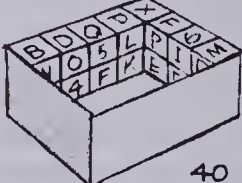
Shelly didn't have enough blocks to fill each box. How many blocks will each box hold?



25



24

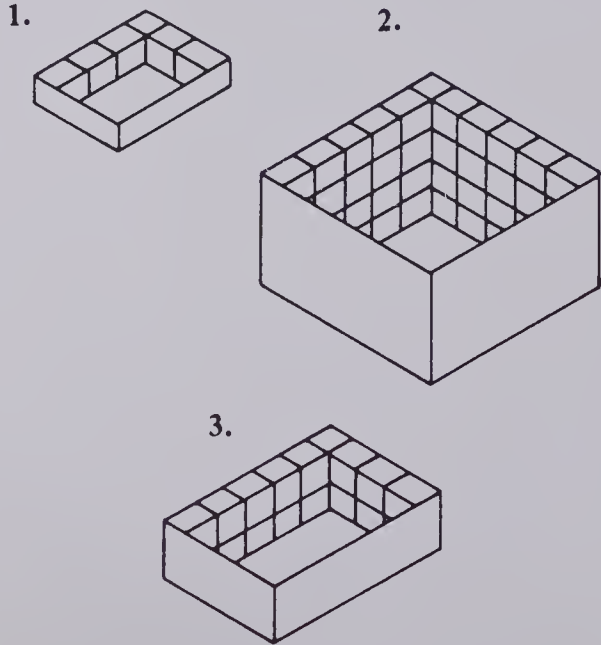


40

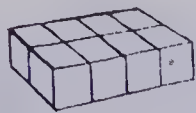
274 Volume meaning and nonstandard units

Using the Book It is important that students visualize blocks in different arrangements. If necessary, have students use blocks and make the arrangements shown in each picture.

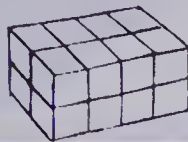
How many blocks are needed to fill each box?



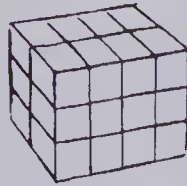
Short Cut to Volume



1 layer
8 cubic units



2 layers
 8×2
16 cubic units

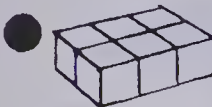


3 layers
 8×3
24 cubic units

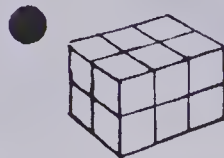
Volume: number of cubic units in 1 layer multiplied by number of layers.

Exercises

Calculate the number of cubic units in each rectangular prism.

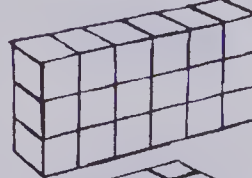


6 cubic units



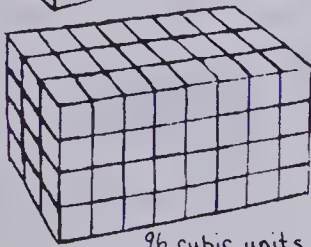
12 cubic units

3.



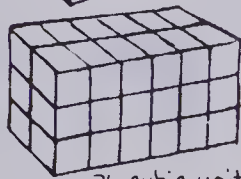
18 cubic units

4.



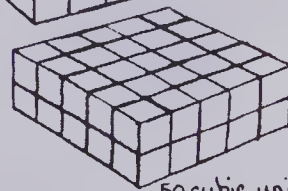
96 cubic units

5.



36 cubic units

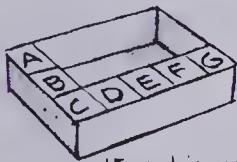
6.



50 cubic units

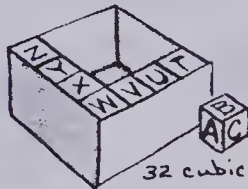
Robbie used blocks to find the volume of boxes. He didn't have enough to fill the boxes. How many cubic units will each box hold?

7.



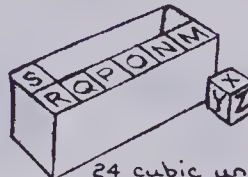
15 cubic units

8.



32 cubic units

9.



24 cubic units

Volume short cut 275

OBJECTIVE

To formalize a method of finding the volume of a rectangular prism: the number of cubes in one layer times the number of layers

PACING

Level A All
Level B All
Level C All

MATERIALS

blocks

SUGGESTIONS

Initial Activity Most students at this age are not ready to internalize the concept of volume as a product of length, width, and height. Hence we use the same approach as we did in area: the number of blocks (units) in one layer, the number in two layers, the number in three layers, etc.

Make a layer of blocks. Ask, "How many cubic units in 1 layer?" Make another layer so there are 2 layers now. "How many cubic units in 2 layers?" Continue making more layers and asking how many cubic units. Repeat with a different first layer.

Using the Book Assign the exercises. Suggest the method above be used (as it is restated in the display). Being able to visualize a given arrangement of blocks is an important skill for students to acquire. Some students may still need to stack the blocks to complete the exercises.

ACTIVITIES

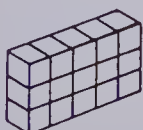
1. Give the students 12 blocks. Ask how many different rectangular prisms they can make. ($1 \times 1 \times 6$, $2 \times 3 \times 1$) Ask them to write the size of each. Repeat for other numbers of blocks.

2. See "Regatta" as described in the Activity Reservoir.

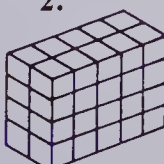
EXTRA PRACTICE

Find the volume of each.

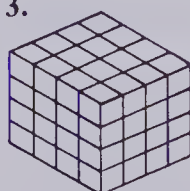
1.



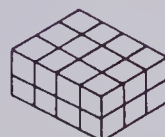
2.



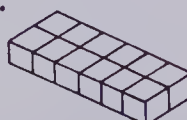
3.



4.



5.



6.



OBJECTIVE

To introduce a standard unit of volume:
the cubic centimetre

PACING

Level A All

Level B All

Level C 1-3, 7-10

MATERIALS

cubic centimetre blocks

SUGGESTIONS

Initial Activity We rely on the fact that students can calculate the number of cubic units in one layer when given the number of blocks in one row and the number of rows (pages 269-270). You may need to reinforce this basic step.

Discuss the cubic centimetre as one measure of volume.

ACTIVITIES

1. Have the students use blocks to build shapes with the dimensions given, and then complete the chart.

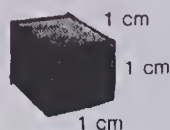
Length	Width	Height	No. of blocks in one layer	No. of layers	Volume
5 cm	2 cm	3 cm			
7 cm	1 cm	2 cm			
3 cm	3 cm	3 cm			
6 cm	5 cm	2 cm			
4 cm	1 cm	1 cm			
2 cm	2 cm	7 cm			
3 cm	5 cm	4 cm			

2. To review the properties of cubes as presented on page 185, prepare and distribute an activity such as:

Count all the flat faces of a cube.
Make a table, like this:

Cubes	1	2	3	4	5	6	7	8	9	10
Faces	6	12								

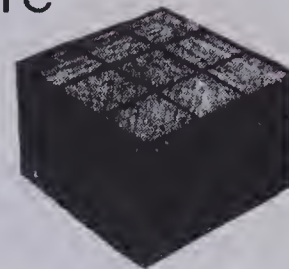
The Cubic Centimetre



One cubic centimetre
 1 cm^3

The **cubic centimetre** is often used as a unit to measure volume.

Joan used 18 centimetre cubes to make this block.



Exercises

- Find the number of cubic centimetres in one layer of each box.
- Find the number of cubic centimetres in each box.

1. (a) 10 cm^3 (b) 20 cm^3

2. (a) 8 cm^3 (b) 40 cm^3

3. (a) 25 cm^3 (b) 50 cm^3

4. (a) 20 cm^3 (b) 60 cm^3

5. (a) 9 cm^3 (b) 36 cm^3

6. (a) 24 cm^3 (b) 72 cm^3

For each

- find the number of cubic centimetres in one layer.
- find the number of cubic centimetres in the box.

7. (a) 10 cm^3 (b) 20 cm^3

8. (a) 18 cm^3 (b) 54 cm^3

9. (a) 20 cm^3 (b) 60 cm^3

10. (a) 50 cm^3 (b) 150 cm^3

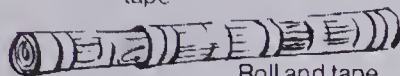
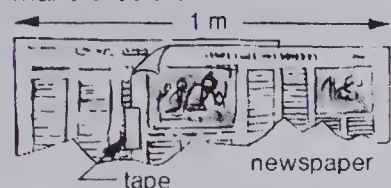
276 Volume: cubic centimetre

Using the Book Emphasize that students are to do (a) and (b) for all the exercises. This is to encourage a "number of cubic units in 1 layer is ____, number of cubic units in ____ layers is ____" reasoning process.

Exercises 7-10 require that students find the number of blocks per layer and the number of layers by counting.

The Cubic Metre

Make a **cubic metre**.



Roll and tape.

Make 12 for each group.

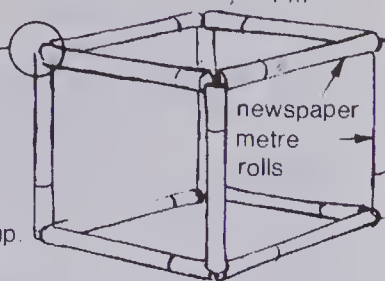
Tape wire to corners.



Make 16 square corners from wire for each group.



A cubic metre
 1 m^3



Exercises

- How many students can stand inside the cubic metre?
- What is the length of each side of the cubic metre? 1 m
- Will your desk fit inside the cubic metre?
- Will the teacher's desk fit inside the cubic metre?

Mark measured his bedroom.

- How many cubic metres could be put in one layer in his room? 12 m^3

- How many layers of cubic metres could he get in his room? 2

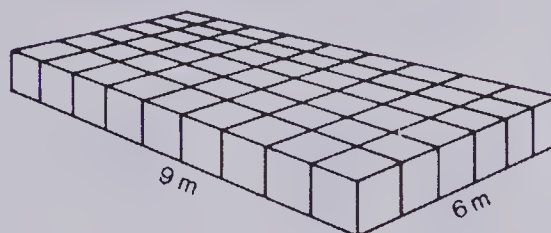
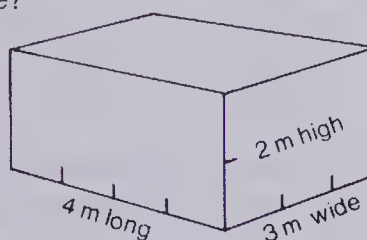
- What is the number of cubic metres of space in his room? 24 m^3

- Ann measured her classroom.

The length is 9 m .

The width is 6 m .

How many cubic metres could be put in one layer on the floor? 54 m^3



Volume cubic metre 277

OBJECTIVE

To introduce the standard unit of volume: the cubic metre

PACING

Level A All
Level B All
Level C All

MATERIALS

newspapers, tapes, wires, metre stick, cubic metre (optional)

BACKGROUND

The purpose of this page is (a) to provide experiences with the cubic metre and (b) to provide referents for various-size rooms.

Using the Book Have groups of students make cubic metres as illustrated.

You may find it desirable to purchase a commercial cubic metre for comparison and display purposes.

A model of a cubic metre is necessary to complete Exercises 1 through 4. The other exercises are an extension of the concept of volume introduced on pages 275 and 276.

ACTIVITIES

- Make up a set of cards each with a picture or name of a rectangular or near rectangular shape. Ask the student to:

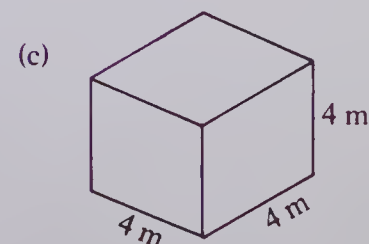
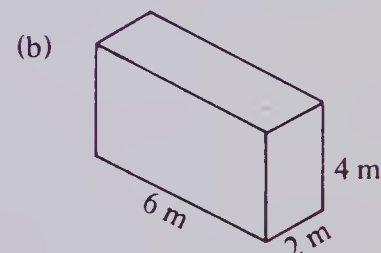
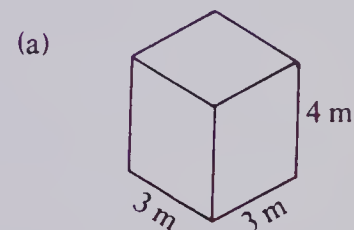
- name the unit most convenient for measuring the volume.
- estimate the volume.

Answers may be written on the back for self-checking.

- Ask the students to calculate the volume of the classroom.

EXTRA PRACTICE

- Joe measured his classroom.
The length is 8 m .
The width is 5 m .
(a) How many cubic metres could be put in one layer on the floor?
(b) The height is 4 m . How many layers of cubic metres could be put in the room?
(c) What is the volume of the classroom?
- What is the volume of each box?



OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

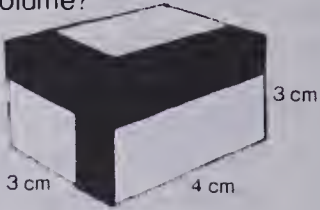
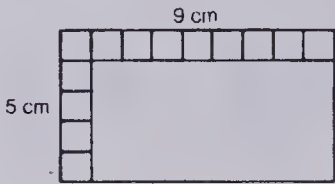
- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS — DM69.

Chapter Test

1. Tell what each underlined number means. (a) 2354 5 tens (b) 25 741 7 tens
2. Find the missing numbers. (a) $6 \times \underline{n} = 24$ (b) $\underline{n} \times 4 = 20$ (c) $27 \div 3 = \underline{n}$ (d) $\underline{n} \div 8 = 16$
3. Multiply. (a) 180×10 1800 (b) 18×10 180 (c) 1.8×10 18 (d) 0.5×10 5
4. Multiply. (a) 30×6 180 (b) 50×4 200 (c) 200×9 1800 (d) 600×7 4200 (e) 40×7 280
- (f) 23×10 230 (g) 45×100 4500 (h) 67×1000 67000 (i) 10×1000 10000 (j) 82×100 8200
5. Divide. (a) $90 \div 10$ 9 (b) $700 \div 100$ 7 (c) $6000 \div 1000$ 6 (d) $27\,000 \div 1000$ 27
6. Multiply. (a) $\begin{array}{r} 23 \\ \times 48 \\ \hline 1104 \end{array}$ (b) $\begin{array}{r} 56 \\ \times 29 \\ \hline 1624 \end{array}$ (c) $\begin{array}{r} 234 \\ \times 73 \\ \hline 17082 \end{array}$
7. Divide. (a) $\begin{array}{r} 21R2 \\ 3 \overline{)65} \end{array}$ (b) $\begin{array}{r} 21 \\ 4 \overline{)84} \end{array}$ (c) $\begin{array}{r} 98 \\ 2 \overline{)196} \end{array}$
- (d) $\begin{array}{r} 131 \\ 7 \overline{)917} \end{array}$ (e) $\begin{array}{r} 68R2 \\ 5 \overline{)342} \end{array}$ (f) $\begin{array}{r} 86R3 \\ 8 \overline{)691} \end{array}$
8. (a) Is 342 divisible by 2? yes (b) Is 615 divisible by 3? yes (c) Is 724 divisible by 4? yes
9. Multiply. $12 \times 10 \times 13$ 1560
10. 285 parcels in each mail truck. 1425
How many parcels in 5 mail trucks?
11. What is the area? 45 cm^2
12. What is the volume? 36 cm^3



278 Chapter 9 Test

Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 244).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1, 5, 7, 8	D	258-261, 264
2, 10	A	248, 263
3	B	250
4	C, D	252, 256, 258-261
6	C	252, 256
9, 11, 12	E	273-277

Cumulative Review

Make each number sentence true.

1. $\square + 12 = 36$
24

2. $8 + \square < 15$ *6 or 5 or ... or 0*

3. $\square + 9 > 16$ *8 or 9 or ...*

4. Add.

$$\begin{array}{r} 3.1 \\ 9.3 \\ 7.4 \\ + 8.7 \\ \hline 28.5 \end{array}$$

5. 396 red balloons at the fair.
500 yellow balloons.
How many more yellow balloons? 104

6. Name an object about (a) 1 mm long (b) 1 cm long (c) 1 km long.

7. Write these using Roman numerals. (a) 16 XVI (b) 128 CXXVIII (c) 41 XLI (d) 94 XCIV

Multiply.

8. $19 \times 0 = 0$ 9. $23 \times 1 = 23$ 10. $2 \times 800 = 1600$ 11. $3000 \times 6 = 18000$

Add.

12.

$$\begin{array}{r} 32.4 \\ + 14.7 \\ \hline 47.1 \end{array}$$

13.

$$\begin{array}{r} \$35.15 \\ + 82.96 \\ \hline \$118.11 \end{array}$$

Subtract.

14.

$$\begin{array}{r} 52.6 \\ - 19.8 \\ \hline 32.8 \end{array}$$

15.

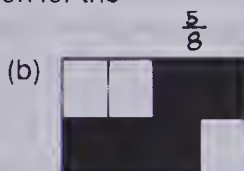
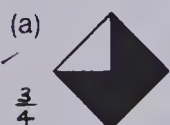
$$\begin{array}{r} \$46.15 \\ - 22.89 \\ \hline \$23.26 \end{array}$$

Estimate the product by rounding the first factor to the nearest hundred.

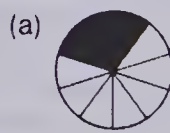
16. $623 \times 7 \approx 4200$ 17. $261 \times 8 \approx 2400$ 18. $847 \times 4 \approx 3200$ 19. $750 \times 9 \approx 7200$

20. Identify each as an odd number or an even number. (a) 46 *even* (b) 33 *odd* (c) 92 *even*

21. Write the fraction for the coloured part.



22. Write the decimal for the coloured part.



Chapters 1-9 cumulative review 279

OBJECTIVE

To review and test selected concepts and skills previously covered

PACING

Level A All
Level B All
Level C All

Using the Book This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1-3	9
4	148
5	25
6(a)	49
6(b)	47
6(c)	51
7	56
8, 9	64
10, 11	83
12	221
13	153
14	223
15	155
16-19	93
20	72
21	129
22(a)	132
22(b)	135

CHAPTER 10 OVERVIEW

This chapter develops bar graphs using various scales and uses bar graphs to introduce line graphs. The concept of temperature is developed through reading and recording temperatures using the Celsius scale. The concept of time is extended through the use of the twenty-four hour clock and the calendar.

OBJECTIVES

- A To read, interpret, and draw bar graphs
- B To read a thermometer and estimate temperatures in the Celsius scale; to add and subtract temperatures
- C To use seconds, hours, days, weeks, months, and years as units of time measure
- D To read and write time using the 24 h clock

BACKGROUND

When students are able to read and interpret bar graphs, they should be given many and varied opportunities to draw such graphs. A flow chart outlining the procedure to be used in drawing graphs is included in the student text. Line graphs are introduced through the use of bar graphs using thin bars. Therefore, students should be comfortable using and drawing bar graphs before starting line graphs. The use of graph paper may facilitate the ease with which students are able to construct their graphs.

For developing temperature and time, it is recommended that real or model thermometers and watches or clocks be used before the children work with drawings.

You may wish to distinguish between “er” and “re” spellings: explain that instruments used to measure are spelled “er” (thermometer) while units of measure are spelled “re” (metre).

MATERIALS

graph paper
thermometers
ice cubes
blocks or centimetre cubes
24 h demonstration clocks
watches or stop watches
calendars

CAREER AWARENESS

Librarian [301]

A librarian is responsible for providing assistance to people using the library and for the cataloguing and care of library books, magazines, and periodicals. This responsibility requires patience and understanding in dealing with people and demands an understanding of a method of classifying and sorting books.

There are two basic areas of library work: reader services and technical services. Reader-service librarians work directly with the public helping people locate books, periodicals, etc. They also conduct reading sessions for very young readers.

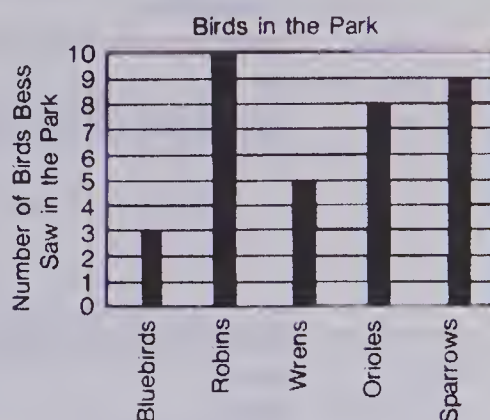
Technical-service librarians are involved with selecting, ordering, cataloguing, and shelving books and display materials.

The size of the library usually determines the range of duties of the people who work there. In a small library, the few employees may be each responsible for the various duties listed above.

A university degree or library science course is usually required to work in a library.

Reading Bar Graphs

Bar graphs show information in a form that can be read easily and quickly. Answer the questions about each graph.



1. Which bird is most common in the park? *the robin*
2. How many wrens did Bess see? *5*
3. What birds did Bess see?
bluebirds, robins, wrens, orioles, sparrows
4. How many bluebirds and orioles did Bess see altogether? *11*
5. How many more robins than sparrows did Bess see? *1*
6. Bess said, "I saw twice as many of one bird as I did of another." Which two birds did she mean? *robins and wrens*
7. If Bess had seen six canaries, how would it be shown? *By a bar going to 6.*



Reading bar graphs 281

Using the Book The three pages, 281-283, represent an extended lesson on reading bar graphs. Discuss the various graphs on pages 281 and 282, noting some possible reasons for the scales of each being different. (80 Solomon's-seals on a 1:1 graph would be too big, harder to read, etc.) Emphasize that each bar of a graph is the same width and that the scale markings are the same distance apart. On these pages, the bar graphs are presented both vertically (page 281) and horizontally (page 282). You may wish to complete the seven exercises on page 281 orally.

Though the intention of these pages is to read bar graphs, some exercises could lend themselves nicely to the partial construction of bar graphs (Exercises. 7, 13, 18, 19, 23, 24). If you use them in this manner, provide graph paper.

OBJECTIVE

To read and interpret bar graphs using scales 1:1, 1:2, 1:10 and 1:5

PACING

Level A 1-19
Level B All
Level C 4-13, 17-24

VOCABULARY

wrens, orioles, mallards, goldeneyes, teals, columbines, Solomon's-seals, balsam, aspen, widgeons, larch

BACKGROUND

A bar graph is a very convenient way of pictorially illustrating statistical information. Generally a bar graph communicates information in a general sense more quickly than does a set of numbers in a chart or list. Bar graphs make comparisons more easily seen than do lists or charts.

A bar graph is closely related to the ordered pair concept introduced and developed in Chapter 11. A pairing is made between a set of items and a set of numbers, one item to one number. For example, in the first graph a pair is established with bluebirds and 3.

SUGGESTIONS

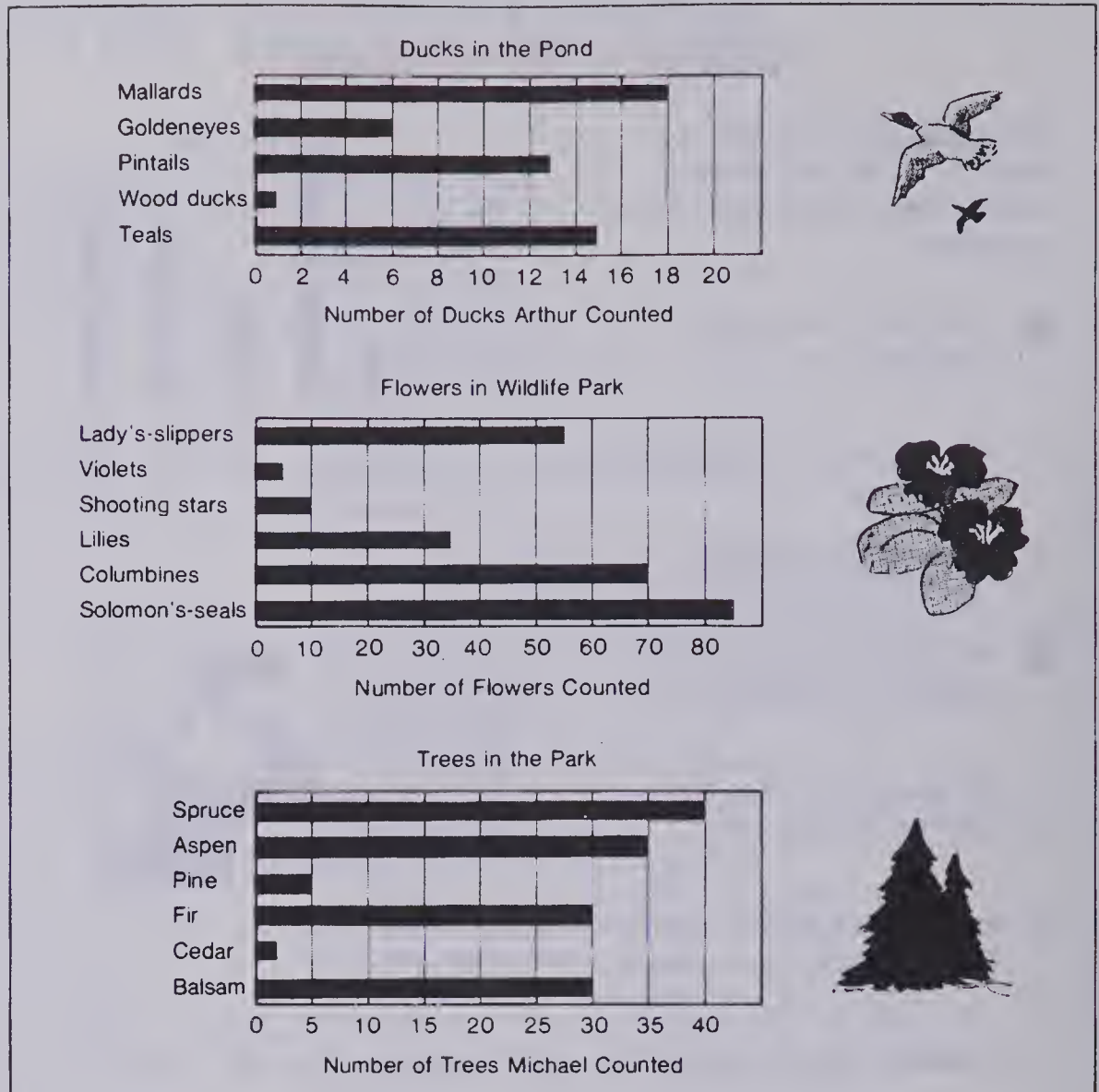
Initial Activity Discuss with the students the information given on a bar graph and how to interpret the given information: (a) read the title to learn what the graph is about; (b) identify what the bars represent; (c) study the scale; (d) note the longest and shortest bars; and (e) note the relative lengths of the bars (e.g., "Is one twice as long as another?").

Discuss the wildlife, both flora and fauna, in a park near the school. Bring the discussion around to how many of each species one might see in the park.

ACTIVITIES

1. From magazines and newspapers have the students obtain and display graphs with scales similar to those illustrated here. Discuss the graphs with the students. Note similarities and differences.

2. Although we call this type of graph a *bar graph*, students may be puzzled by this term. A library project could be developed by having students find several different meanings for the word "bar" and then define and illustrate each (sand bar, chocolate bar, chinning bar, music bar, to bar entry, etc.).



● Which duck is most common in the pond? the mallard

● Which duck is least common? the wood duck

● How many pintail ducks were seen? 13

11. How many more teals than wood ducks were seen? 14

12. Arthur said, "I saw three times as many of one duck as I did of another."
Which two ducks did he mean? mallards and goldeneyes

● If Arthur had seen nine widgeons, how would it be shown?
By a bar going to between 8 and 10.

A class counted the number of flowers in Wildlife Park.

14. How many Solomon's-seals did the class count? 85

15. How many lilies did the class count? 35

16. How many more lady's-slippers were there than shooting stars? 45

17. How many times as many columbines as shooting stars were there? 7 times

18. If the class had counted 25 wild roses, how would it be shown? By a bar going to between 20 and 30.

19. If the class had counted 110 Indian paintbrushes, how would it be shown?
By extending the graph and then by a bar going to 110.

Michael counted the trees in the park.

20. What kind of tree is most common? the spruce

21. What tree is least common? the cedar

22. There were the same number of two kinds of trees. Which kinds of trees?
fir and balsam

23. If 15 maples had been counted, how would this be shown? By a bar going to 15.

24. If 32 larch had been counted, how would this be shown? By a bar going $\frac{2}{5}$ of the way between 30 and 35.

Reading bar graphs 283

EXTRA PRACTICE

	a	b	c	d		
	5	6	7	2	5	
e	6		f	8	3	5
						g
						4
h	i				j	
	5	4		8		6
						5
k					l	
	5	0	6		7	0
						5
m			n			
	8	0		7		6
						6
	0		p	8	0	q
					1	
						4
	r	9	9	0	1	0

ACROSS

a fifty-six thousand, seven hundred twenty-five

f $91 \times 9 + 16$

h $5400 \div 100$

j $650 \div 10$

k 50.6×10

l $3525 \div 5$

m Round 77 to the nearest multiple of 10.

o $12 \times 5 + 6$

p $10 \times 10 \times 10 - 199$

r $10\,000 - 99 + 89\,109$

DOWN

b $9 \times 9 - 13$

c 123×6

d 5×5

e sixty-five thousand, five hundred eighty

g 5555 more than forty thousand, nine

i 4×100

j 101×6

n $7000 \div 10$

p $89 \times 10 \div 10$

q $99 \div 9$

OBJECTIVE

To draw bar graphs with scales 1:1, 1:2, 1:5, and 1:10

PACING

- Level A All
- Level B All
- Level C 2-4

VOCABULARY

Cooper's, Harlan's, goshawk, locoweed, camas, nettle, labrador tea

MATERIALS

graph paper

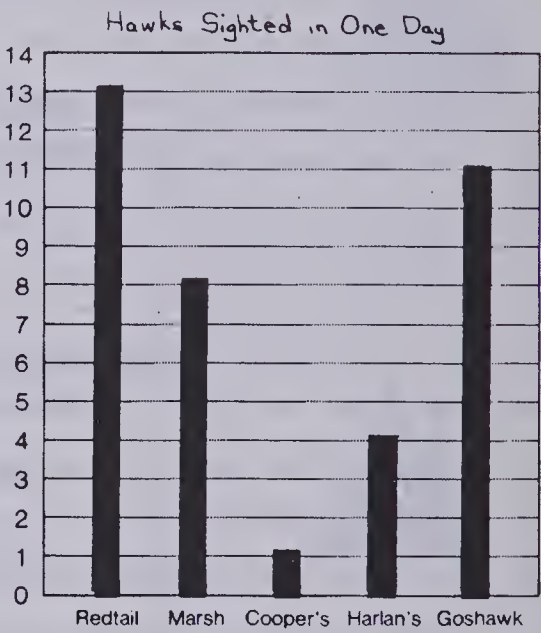
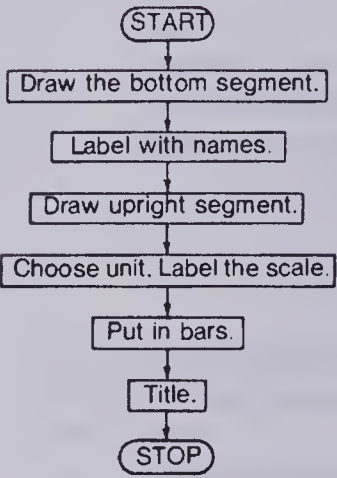
SUGGESTIONS

Initial Activity Review counting by 2's, 5's, and 10's. Display a bar graph taken from a newspaper or magazine. Ask the students to identify from the graph the information given to make the graph meaningful (title, scale, clarity, axes identification, etc.). Discuss other ways the graph might have been drawn (vertical or horizontal, wide or narrow bars, colour or black and white, etc.).

Drawing Bar Graphs

1. A class was studying hawks in the park. Draw a bar graph to show the data in the chart.

Kind of Hawks	Number of Hawks Sighted in One Day
Redtail	13
Marsh	8
Cooper's	1
Harlan's	4
Goshawk	11



2. Make another graph using the information from Question 1. Use units of 2's in your scale.

Using the Book You may wish to do the first exercise with the class assisting in drawing the graph on the chalkboard. Emphasize the steps in the flow chart. Encourage the students to read and identify the information given in the charts. Suggest they follow the steps in the flow chart. Emphasize the need to decide on the scale (unit) to be used and mark it off before starting to draw the bars.

3. The class recorded the number of dangerous plants in the community. Draw a graph to show the types and numbers of dangerous plants.

Plant	Number	Reason It's Dangerous
Poison Ivy	5	Causes painful rash.
Locoweed	15	Makes cattle wild.
Camas	40	Poisonous if eaten.
Nettle	55	Causes rash.
Monkshood	30	Seeds and stems are poisonous.



4. The class recorded the number of plants in a forest which can be eaten.
- (a) What unit will you use for the scale? 10's
- (b) Draw the graph to show this information.

Plant	Number of Plants	Part To Be Eaten
Blueberries	90	Berries
Raspberries	95	Berries
Arrowheads	80	Tubers
Labrador Tea	70	Leaves
Milkweed	35	Pods
Cattails	100	Roots and stems peeled

ACTIVITIES

- Have students collect information on a topic of their choice. Then have them show the information in a chart and draw a bar graph to tell a picture story of the information gathered, e.g.,
 - number of a type of bird, animal, or plant in the local park or zoo
 - number of students in each grade in the school
 - number of students with different coloured eyes
 - favourite cereal (hot, cold, none at all).
- Have each student make a bar graph of test results, quizzes, etc. for a two- to four-month period. Ask them what information the graph shows that is useful to them (getting better, faster, worse!, etc.).

OBJECTIVE

To read and interpret bar graphs with scales 1:50, 1:100, and 1:500

PACING

- Level A 1-12
- Level B 1-12
- Level C 7-16

MATERIALS

graph paper

SUGGESTIONS

Initial Activity Have students count by 50's from 0 to 500 and by 500's from 0 to 5000.

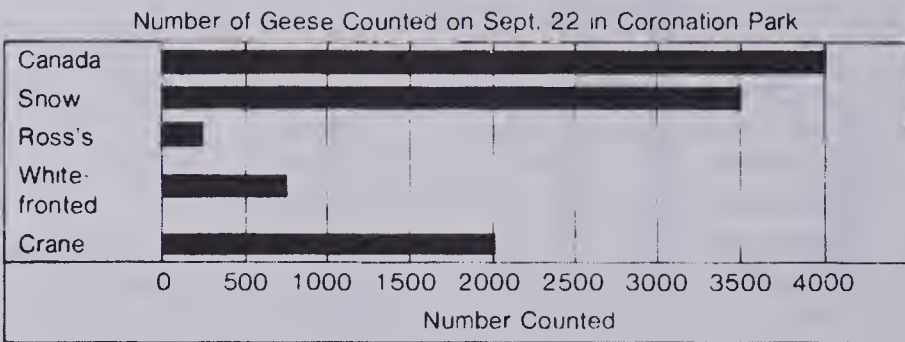
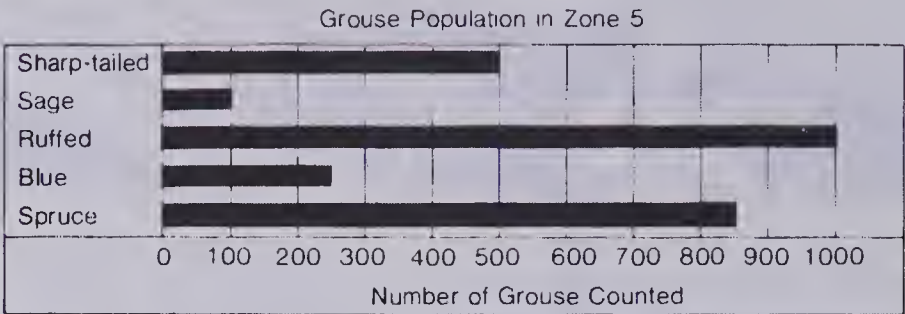
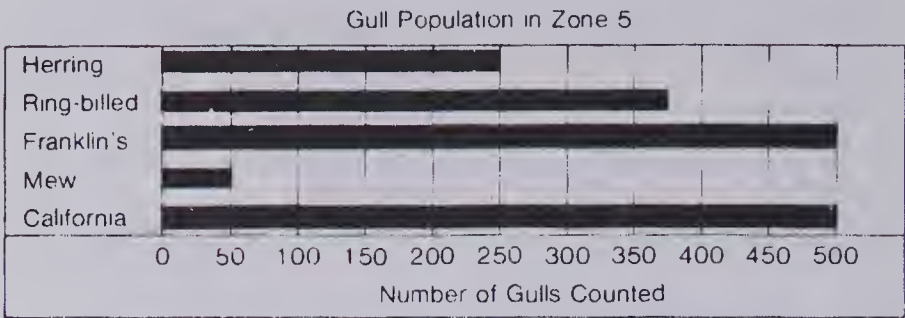
Ask the students to name numbers between 100 and 200, and 350 and 400 by asking questions such as: "Name a number between 100 and 200.", "Name a number that ends in 5 between 100 and 200." Then ask them: "Which number is halfway between 200 and 300?", "What number is halfway between 1000 and 2000?", and "Name a number about halfway between 350 and 400" (acceptable answer: 375) and "between 500 and 1000. (acceptable answer: 750)"

Prepare for the theme of the pages by asking the students to imagine they are wildlife lovers, protecting and counting species. Discuss the role of conservation officers and forest rangers.

ACTIVITIES

1. Make a bulletin-board display of bar graphs taken from newspapers, magazines, student work, etc. Compare the graphs for size of scale, clarity, appearance, etc.
2. Students may enjoy collecting pictures to illustrate the topics in the graphs.
3. Ask the students to research to find which of the birds named in the graphs are seen in your area. Determine whether the birds are resident year round, summer or winter residents, or just passers-through on their migration.

Reading Bar Graphs



286 Reading bar graphs — 1:50, 1:100, 1:500

Using the Book With the Level A students you may wish to do orally a selection of questions to get the class started. Discuss each graph in turn and discuss Exercises 5, 6, 10, 11, and 12 before assigning the page.

Students will have to identify the number halfway between two given numbers since some of the bars do not end on the lines. The size of the numbers used may mean some students will require additional practice reading, writing, and identifying the point halfway between two large numbers.

Emphasize that the bar graph shows data in a form easily and quickly read and interpreted. Usually we look for the longest bar, the shortest bar, bars that are multiples of other bars (twice, half), etc.

A forest ranger took a population count of birds in an area.
Answer the questions about the number of gulls and grouse.

- Which gull is least common? *the mew gull*
- Which two gulls had the same population? *Franklin's gull and California gull*
- How many mew gulls were counted? *50*
- 4. How many ring-billed gulls were counted? *375*
- 5. Which gull had a population count one half that of the Franklin's gulls? *Herring gull*
- If 225 Bonaparte's gulls had been counted, how would this be shown?
By a bar going to between 200 and 250.
- 7. Which grouse is least common? *the sage grouse*
- 8. The ruffed grouse was four times as plentiful as which grouse? *the blue grouse*
- 9. How many sage grouse were there? *100*
- 10. How many spruce grouse were there? *850*
- 11. How many more sharp-tailed grouse than blue grouse were counted? *250*
- 12. If 50 willow ptarmigan had been counted, how would this be shown?
By a bar going to between 0 and 100.

A population count of geese was taken in Coronation Park on September 22.

- 13. How many crane geese were counted? *2000*
- 14. How many Ross's geese were counted? *250*
- 15. The geese were counted as they migrated south. If the same number were counted four days in a row, how many Canada geese would have been counted? *16 000*
- 16. Which is the most common goose? the least common? *Canada goose*
Ross's goose

EXTRA PRACTICE

1. Name four numbers that are between:

(a) 50 and 100	(b) 325 and 550
(c) 800 and 900	(d) 150 and 200
(e) 100 and 125	(f) 2500 and 3000
(g) 1000 and 1500	(h) 0 and 25.
2. Name the number that is halfway between:

(a) 100 and 200	(b) 150 and 200
(c) 500 and 1000	(d) 600 and 1200
(e) 300 and 600	(f) 400 and 450
(g) 2500 and 3000	(h) 1500 and 2500
(i) 100 and 700	(j) 500 and 2500.

OBJECTIVE

To draw bar graphs using scales 1:50, 1:100, and 1:500

PACING

Level A 1-4
Level B 1-4
Level C 1, 3-5

VOCABULARY

pygmy, saw-whet, magpies, grackles, orioles, grosbeaks, waxwings, kinglets, vireos

MATERIALS

graph paper

SUGGESTIONS

Initial Activity Review the steps to be followed in constructing a bar graph. page 284. Emphasize the need to choose a scale to mark it off, and to label it before placing on the bars.

ACTIVITIES

1. Draw a bar graph to show this data.

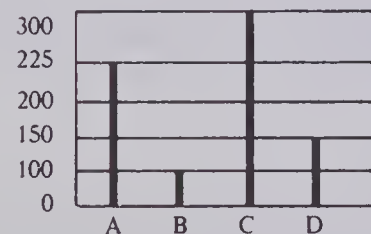
Height of Trees in Metres	
Pine	125
Sequoia	400
Cedar	200
Giant Redwood	275

2. Collect data locally and draw graphs to "tell a story". Students may want to illustrate their graphs using pictures. Display a selection of graphs on the bulletin board.

3. Ask the students to collect bar graphs in which the scales are 1:50, 1:100, 1:500, etc. They are to identify the scale and record it on the graph in this manner: "1 unit represents 500."

EXTRA PRACTICE

1. With better students, you may ask: "Why is the bar graph shown not acceptable?"



Answers:

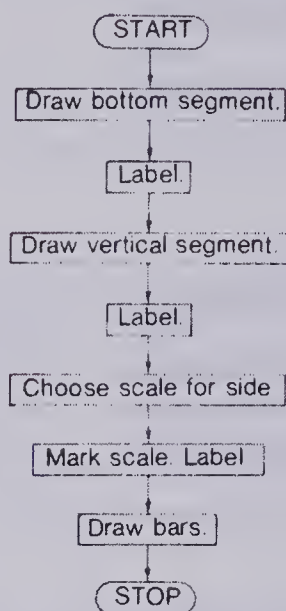
- (1) Scale is not the same throughout.
- (2) Spacing of scale lines is not the same.

Results:

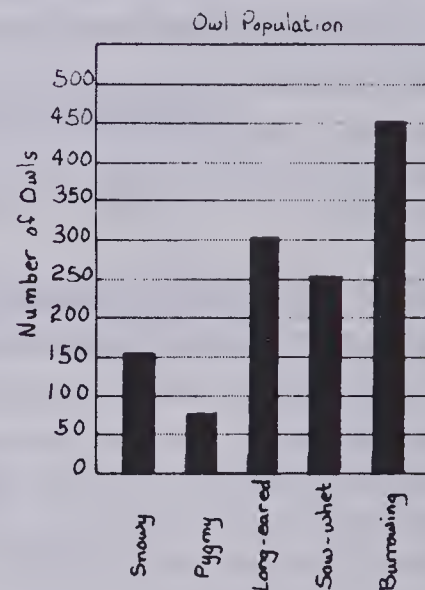
Example The number of C's appear to be 3 times that of D's, yet it is really only double.

Making More Bar Graphs

1. A population count of owls was taken. Draw a bar graph to show the information in the chart.



Type of Owl	Number
Snowy	150
Pygmy	75
Long-eared	300
Saw-whet	250
Burrowing	450



288 Drawing bar graphs

Using the Book You may wish to do Exercise 2 orally before assigning Exercises 3-5. Take note of those having difficulty and do extra practice with them.

You may also wish to do some group graphs so that weaker students can be helped by stronger students. These graphs can be large ones suitable for display in the classroom. See Activity 1.

Choosing an appropriate scale for a graph is often the most difficult part of drawing a graph. Students may require some help in deciding on a scale for Exercises 3-5.

2. What number is halfway between these numbers?

- 50 and 100 75 ● 100 and 200 150 ● 500 and 1000 750
(d) 450 and 500 475 (e) 750 and 800 775 (f) 300 and 350 325
(g) 700 and 800 750 (h) 200 and 300 250 (i) 400 and 500 450

The following estimates were made of the number of birds in a bird sanctuary.
Draw bar graphs to show the information. Label and title each graph.

3. Undesirable birds.



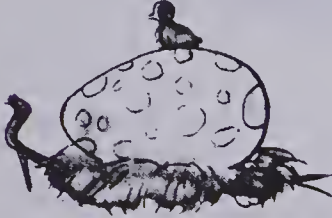
Name	Number
Starlings	900
Crows	250
Magpies	150
Cowbirds	700
Grackles	450

4. Colourful birds



Name	Number
Orioles	4000
Grosbeaks	1500
Warblers	250
Waxwings	250
Flycatchers	2500

5. Small birds.



Name	Number	Size
Hummingbirds	250	7 cm
Wrens	4500	9 cm
Chickadees	3000	7.5 cm
Kinglets	3500	10 cm
Vireos	2250	12 cm
Warblers	500	11 cm

2. Provide exercises that require students to round numbers before graphing.

Length of Ships in Metres		
Name	Country	Length
France	France	315
Queen Elizabeth	England	314
Queen Mary	England	311
Normandie	France	314
Titanic	England	269
Bismark	Germany	291
Mauretania	England	240

Ask students to round the numbers to the nearest ten, then draw a bar graph to illustrate the data.

OBJECTIVE

To read and draw bar graphs using segments instead of bars

PACING

- Level A 1-6
- Level B 1-6
- Level C All

VOCABULARY

Dolly Varden, Peyto Lake, Cirque Lake

MATERIALS

graph paper

BACKGROUND

Line (segment) graphs are a type of bar graph. Emphasize that the lines or bars are essentially the same here as in previous pages. However, you may wish to emphasize this still further by using a single pen line _____.

Review the steps shown on page 284 of the student text.

SUGGESTIONS

Initial Activity Discuss the various types of graphs the students have learned to read and draw (pictograph, bar graph) and discuss some of the similarities and differences of the two types.

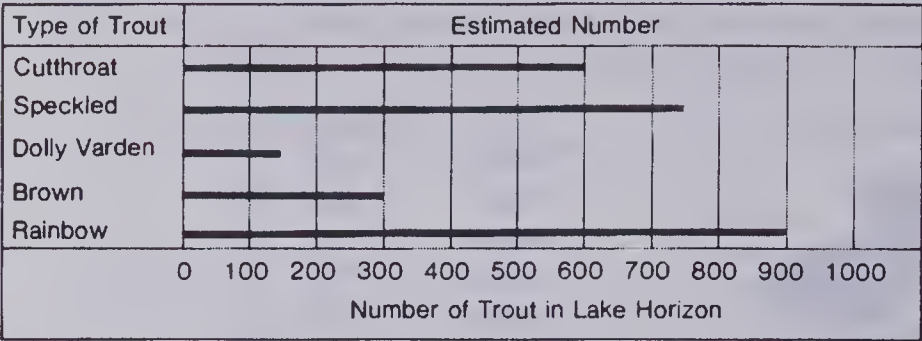
Review betweenness (halfway) and the need to interpolate (read between the lines) with some degree of accuracy.

ACTIVITIES

1. Have the students find examples of line (segment) graphs in newspapers and magazines. Speculate as to why the graph is drawn with segments rather than bars.
2. Have students suggest possible reasons for various commercial publications using graphs rather than other ways of presenting information (i.e., charts, lists, and so forth).
3. Have students record the temperature (high or low) for a period of time and then draw a bar graph to illustrate the findings. You may wish to assign the recording of the daily temperature to students in turn and have a large graph for display purposes made. Average temperatures for weeks, months, etc. can be found. Discuss why a line (segment) graph is suitable for displaying information on temperatures.

Line Graphs

Line segments are sometimes used in place of bars in graphs. The number of trout in Lake Horizon was estimated.



1. How is the number of cutthroat trout shown? By a line going to 600.
 2. How many speckled trout are estimated to be in Lake Horizon? 750
 3. How does this graph differ from those on Pages 281 and 282? Line segments are used in place of bars.
- Draw line segment graphs to show the information.
4. Number of people registered for an overnight hike to Cascade Falls during the summer months.

Month	Number of Hikers Registered
June	250
July	700
August	900
September	450
October	100

290 Using segment in place of bar

Using the Book Have students read and interpret the information shown in the graph on page 290. Point out that these “segment” graphs are really bar graphs and that the same steps used to draw bar graphs are used to draw these line graphs.

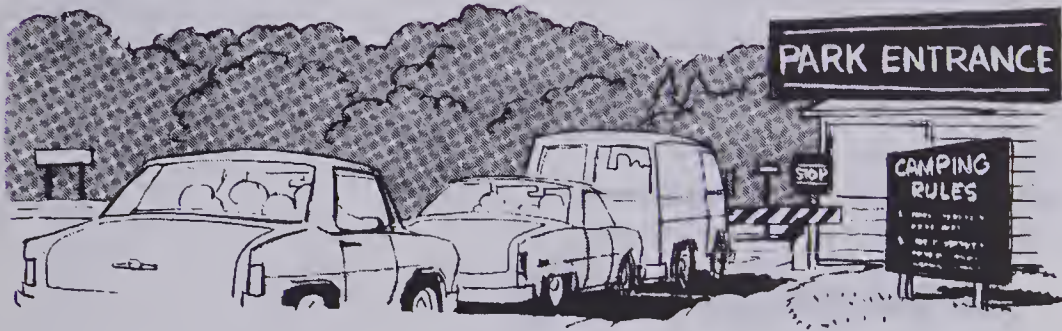
Emphasize that deciding on a scale prior to drawing the “segments” is necessary. Note the large numbers used in these graphs.

5. The number of people that visited the park from July 10 to July 15.

Day	Number of Visitors
July 10	500
July 11	750
July 12	1500
July 13	4500
July 14	3000
July 15	1250

6. A national park recorded the number of cars that entered the park during certain months.

Month	Number of Cars
January	1500
April	3000
July	5000
September	3000
November	2500



7. The trails in the park were listed with the times normally required to make a one-way trip.

Name of Trail	Time in Minutes
Peyto Lake	90
Red Earth Creek	120
Bow Summit	30
Cirque Lake	180
Three Glaciers	240

- (a) Why do you think the unit of 60's or 30's would be used?
The minutes given are multiples of 30's or 60's.
 (b) Make a graph for the information.
 ★(c) Make a second graph for the number of hours for a round-trip hike on the trails listed. What unit will you use? *h's*

EXTRA PRACTICE

1. Draw line graphs to display the data.

Temperature (Celsius)
at noon each day for a week

Sunday	23°
Monday	30°
Tuesday	34°
Wednesday	38°
Thursday	33°
Friday	35°
Saturday	24°

2. Round the data to an appropriate place value first.

Number of trees felled monthly
by a logger

November	685
December	315
January	415
February	576
March	703

The number of trees felled in December, January, and February is less than in November and March. Why do you think this would happen? (Some answers: Short work months with Christmas holidays and February has only 28 d; January might have been too cold to work every day; hours of daylight might have a limiting effect; etc.)

OBJECTIVES

To review common temperatures
To read a thermometer scale
To use temperature readings in problem situations

PACING

Level A All
Level B All
Level C All

VOCABULARY

temperature, normal, thermometer, degrees

MATERIALS

thermometers—real and model

RELATED AIDS

HMS—DM70.

SUGGESTIONS

Initial Activity Review with the students some of the common referent temperatures such as freezing point of water, boiling point of water, hot summer day, room temperature, etc.

Discuss the markings on a thermometer (long marks, short marks) and review the method of reading the temperature shown on a thermometer.

ACTIVITIES

1. Ask the children to read and keep a record of outside temperatures for a week. They can record the temperatures at the beginning of the school day, at noon, and at the end of the day. They could make comment beside each temperature to describe the temperature as hot, cold, warm, chilly, etc.

2. Ask the students to research Anders Celsius and write a short report on this man.

3. Discuss with the students the location of the thermometer and how the temperature readings might be changed by placing the thermometer on other places. (Thermometer on north side of a building in constant shade is likely to reflect the true air temperature; thermometer on south side of a building in sun at noon will not reflect true air temperature; thermometer on east side of building will likely show hotter temperatures in morning than in afternoon; etc.)

EXTRA PRACTICE

1. See DM70.

Temperature

Find each temperature on the thermometer.

1. highest temperature recorded in Canada G
2. cold summer day O
3. normal body temperature R
4. room temperature T
5. temperature of freezing water I
6. temperature of boiling water N
7. hot summer day H

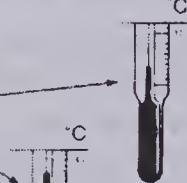

Copy the blanks and numbers.

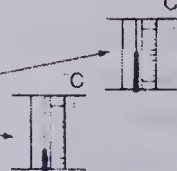

Place the letters from the thermometer in the blanks.

You will know when you are correct.

R	I	G	H	T	O	N
3	5	1	7	4	2	6



8. On a warm winter day the temperature was 
On a warm summer day the temperature was 
How many degrees warmer was it on the summer day than the winter day? 24°C


9. When Garcia got up in the morning the thermometer was 
When he had lunch the thermometer was 
How many degrees did the temperature go up? 16°C

292 Temperature


Using the Book Caution the students *not* to write in the text but to copy the blanks and numbers in their scribbles, then fill in the blanks.

Exercises 8 and 9 require solving the problem by adding or subtracting after reading the thermometer scale.

Note: We do not introduce minus degrees at this point. Hence the winter day is "warm" rather than "cold". You, however, may wish to introduce minus degrees if you feel your particular group is ready for it.

2. On a cool summer morning the temperature was 

The temperature went up 18°C by noon.
What was the temperature at noon?

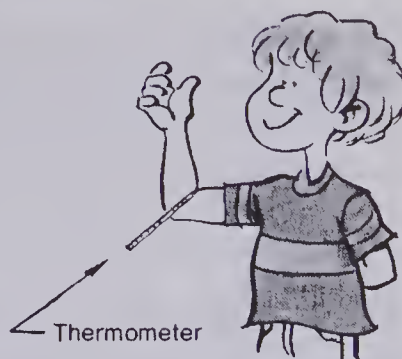
3. On a warm summer afternoon the temperature was 

By evening the temperature had dropped 16°C .
What was the evening temperature?

Guessing Temperature

Think about each. Guess what the temperature is.
Record your guess. Use a thermometer to check.

1. temperature in your room
2. temperature of tap water
3. temperature of glass of water with ice cube
4. temperature of inside your elbow
5. temperature outside



Tune Up

Add.

1. 34.3 $+ 4.7$ <hr/> 39.0	2. 35.9 $+ 2.3$ <hr/> 38.2	3. 46.3 $+ 8.8$ <hr/> 55.1	4. 36.2 $+ 2.8$ <hr/> 39.0	5. 35.6 $+ 3.2$ <hr/> 38.8
--------------------------------------	--------------------------------------	--------------------------------------	--------------------------------------	--------------------------------------

Subtract.

6. 38.3 $- 3.6$ <hr/> 34.7	7. 36.4 $- 1.9$ <hr/> 34.5	8. 41.1 $- 3.4$ <hr/> 37.7	9. 40.0 $- 4.9$ <hr/> 35.1	10. 36.0 $- 0.9$ <hr/> 35.1
--------------------------------------	--------------------------------------	--------------------------------------	--------------------------------------	---------------------------------------

Add or subtract.

11. 34.3 $+ 21.2$ <hr/> 55.5	12. 28.4 $+ 26.9$ <hr/> 55.3	13. 36.4 $- 21.9$ <hr/> 14.5	14. 51.8 $- 29.9$ <hr/> 21.9	15. 80.1 $- 43.2$ <hr/> 36.9
--	--	--	--	--

Temperature, drill 293

Using the Book Remind students to use referent temperatures before making a guess. Reinforce these temperatures by asking students to check each guess by actual measurement.

Tune Up. This review consists of skills that will be required in doing the exercises on pages 294 and 295. It is essentially a review of the addition and subtraction of decimals as presented on pages 139-149 with the inclusion of 2 digits to the left of the decimal point.

OBJECTIVES

To estimate temperature
To add and subtract tenths

PACING

Level A All
Level B All
Level C All

MATERIALS

thermometers, ice cubes

SUGGESTIONS

Initial Activity Review the referent temperatures suggested on page 292. For the Tune Up, elicit from the students that the method for addition and subtraction of decimal numbers is the same as for whole numbers *after* the decimal points have been aligned.

ACTIVITIES

1. Refer to Toss 'N' Tell in the Activity Reservoir. Prepare the playing board using a grid like this.

0.5	6.9	1.2
8.9	26.4	8.7
2.3	7.8	3.0

Each player keeps a running total of his score. The winner is the first to reach 100 or more.

2. Play the game "Smile" with the students. You call a temperature — if it's hot they wipe their brow; if it's warm they smile; if it's cold they shiver. Remind them they can't smile and shiver both, nor smile and wipe their brow both.

Examples

40°C wipe brow	33°C wipe brow
20°C smile	22°C smile
0°C shiver	7°C shiver

EXTRA PRACTICE

Refer to the temperature chart. What is the difference in temperature between "cold" and "very hot" in summer? What is the difference between "cool" and "hot" shown in winter? What is the difference in temperature between summer warm and cold days?

Temperature Ranges in Toronto

	Summer	Winter
Very Hot	40°C	
Hot	30°C	15°C
Warm	20°C	10°C
Mild	15°C	5°C
Cool	10°C	0°C
Cold	5°C	

OBJECTIVE

To read a clinical thermometer to one tenth of a degree in decimal form

PACING

Level A 1-20

Level B 3-12, 17-22

Level C 3-12, 17-25

VOCABULARY

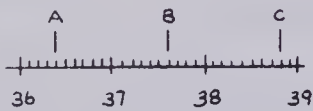
clinical, portion, marathon runner, seriously, spiny anteater

MATERIALS

thermometers—model and clinical

SUGGESTIONS

Initial Activity Review the decimal number line:



Have the student take his temperature by placing the clinical thermometer in his elbow and bending his arm. Ask the student to read the thermometer. Since the scale is graduated in tenths it will remind them of the decimal number line. Remind students that normal body temperature is 37°C .

ACTIVITIES

1. Have students find out where clinical thermometers are commonly used and how they differ from thermometers used to find air temperature.

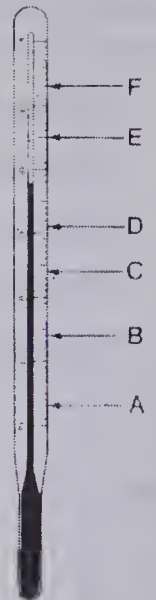
2. If possible, find the record high and low temperatures recorded for humans. Distinguish the intervals of fever, hypothermia, danger, etc. for humans. Report on hypothermia.

3. A library project requiring research on the normal temperature of various mammals may be of interest to some students.

Clinical Thermometer

Tom's Mother uses a clinical thermometer to take Tom's temperature. Note the scale shows tenths of a degree.

The temperature shown is 37.8°C



Exercises

Refer to the thermometer in the display.

- What is the lowest temperature shown? 34.3°C
the highest? 39.3°C

2. How many degrees of temperature change can be shown by this thermometer? 6°C
3. Tom's temperature is shown in the display. It is 0.8°C above his normal temperature. What is his normal temperature? 37°C
4. What would be the temperature at each of the points shown?

A 34.3°C B 35.4°C C 36.4°C D 37.1°C E 38.5°C F 39.3°C

How many degrees does the temperature rise in going from:

- A to B? 1.1°C ● A to C? 2.1°C 7. A to D? 2.8°C 8. B to F? 3.9°C
9. C to E? 2.1°C 10. B to D? 1.7°C 11. A to F? 5.0°C 12. C to D? 0.7°C
13. B to C? 1.0°C 14. D to E? 1.4°C 15. A to E? 4.2°C 16. B to E? 3.1°C

294 Body temperature

Using the Book Discuss the thermometer shown on the page. Emphasize the necessity for reading the thermometer to the nearest tenth of a degree.

Remind students that normal body temperature is 37.0°C . It will be necessary to use tenths of a degree in solving the problems.

17. What portion of a degree does each mark on the scale represent? 0.1 of a degree

18. What is the normal body temperature? 37°C

19. Can the thermometer be used to measure the temperature of a comfortable room? Why? No because the scale on the thermometer does not go low enough.

20. Tom's temperature reached a high of 39.1°C .

He was very sick.

It dropped 1.8°C .

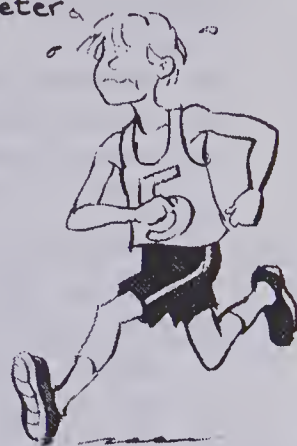
What is his temperature now? 37.3°C

Is his temperature back to normal? No

21. When Tom's temperature returned to normal, he said,

"My temperature has dropped 2.3°C ."

What was his temperature before the drop? 39.3°C



22. A marathon runner in hot weather had a body temperature of 40.3°C .

How much is this above the normal body temperature? 3.3°C

23. It is reported that a seriously ill woman had a low temperature of 16.0°C .

How much is this below normal? 21°C

24. Some birds have a very high body temperature.

One bird, the swift, has a normal temperature of 44.7°C .

How much higher is this than a person's normal temperature? 7.7°C

25. The spiny anteater of Australia has a normal body temperature of 23.3°C .

How much less is this than the normal temperature of a person? 13.7°C

EXTRA PRACTICE

Add.

1.	36.4	2.	23.6
	$+ 1.4$		$+ 2.9$

3.	30.3	4.	9.6
	$+ 0.9$		$+ 12.8$

5.	16.3	6.	19.9
	$+ 2.0$		$+ 19.9$

7.	27.8	8.	22.8
	$+ 1.2$		$+ 8.8$

Subtract.

1.	38.9	2.	39.2
	$- 1.2$		$- 3.6$

3.	27.8	4.	29.8
	$- 6.8$		$- 8.0$

5.	33.3	6.	26.4
	$- 3.3$		$- 26.4$

7.	30.0	8.	19.9
	$- 8.9$		$- 19.8$

Add or subtract.

1.	0.6	2.	26.4
	$+ 16.3$		$- 9.4$

3.	16.8	4.	24.6
	$- 8.6$		$+ 9.8$

5.	33.3	6.	9.0
	$+ 4.4$		$- 8.9$

7.	2.0	8.	44.1
	$+ 23.9$		$- 14.4$

OBJECTIVE

To use area and volume concepts in practical problems

PACING

Level A 1-3
Level B 1-3
Level C 2-4

VOCABULARY

canvas tarp

MATERIALS

cube blocks

RELATED AIDS

CALC. W/BK—29.

SUGGESTIONS

Initial Activity Review with students the method for finding volume (see pages 274 and 275):

number of cubic units in one layer,
in two layers,
in three layers,
etc.

Have students build shapes using the cubes. They are to calculate the number of cubes in each shape. Elicit from students how they calculate the number in each shape. Some students may have discovered the short cut (formula) for finding volume (page 275). Lead a discussion on the use of mathematical symbols to represent a measure or idea in short form (cm, =, \times , km/h, m^2 , m^3 , etc.). The short form for writing one square metre costs \$9.56 is \$9.56/ m^2 (read \$9.56 per square metre).

ACTIVITIES

1. Have students make a list of the things they can find around the school that have a volume measure. Then have them find the volume of one of the things by measuring, filling with blocks, or any convenient method the student can find.

2. Give the students a set of 20 blocks and ask that as many different rectangular prisms as possible be made. Then find the area of each side and the volume of the shape made. (You may wish them to make as many shapes — any shape — as possible and to record the volume of each. This should be pursued especially with any student who may not be conserving at this time.)

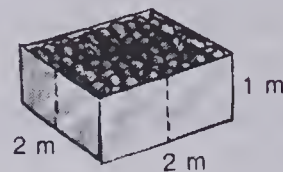
Picking Potatoes

Carrie and Susan picked potatoes for their Father.

They received \$3.25 for each cubic metre of potatoes picked.

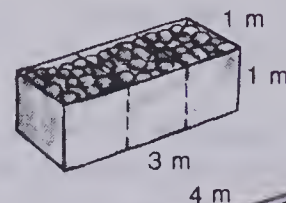
1. Carrie filled this box with potatoes in two days.

- (a) How many cubic metres of potatoes did he pick? $4m^3$
(b) How much money would he get for the two days of work? \$13.00



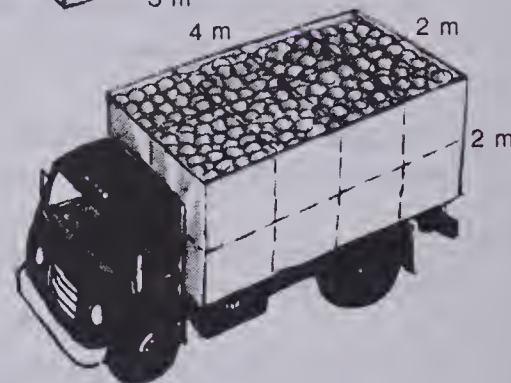
2. Susan filled this box by working Monday and Tuesday.

- (a) How many cubic metres of potatoes did she pick? $3m^3$
(b) How much money would she get for the two days of work? \$9.75



3. The hired help filled this truck box.

- (a) How many cubic metres of potatoes are in the load? $16m^3$
(b) Potatoes sell for about \$81 for each cubic metre. How much is the load worth? \$1296



- ★ 4. Carrie and Susan's Father bought a canvas tarp to cover the potatoes in the truck box. The canvas is 1 m longer and 1 m wider than the box.

- (a) How many square metres of canvas are necessary? $15m^2$
(b) The canvas cost \$9.56/ m^2 .
How much did the canvas cost? \$143.40

296 Area and volume problems

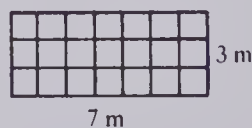
Using the Book Remind students that one unit of cubic measure is the cubic metre.

In Exercise 4, suggest students draw a diagram (and label it) of the canvas tarp. How long is it? How wide is it?

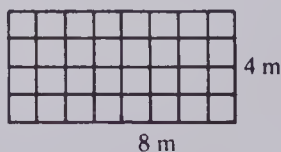
EXTRA PRACTICE

Calculate the area of each.

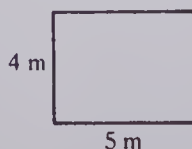
1.



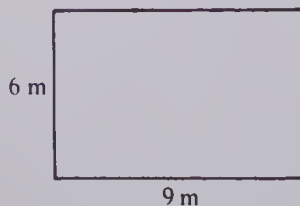
2.



3.

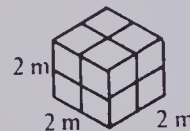


4.

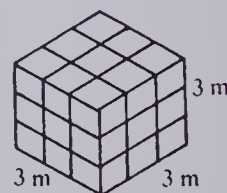


Calculate the volume of each box.

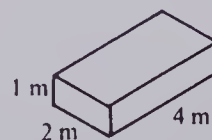
5.



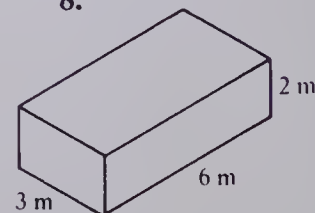
6.



7.



8.



Tune Up

Add.

$$\begin{array}{r} 1. \quad 341 \\ + 247 \\ \hline 588 \end{array}$$

$$\begin{array}{r} 2. \quad 451 \\ + 516 \\ \hline 967 \end{array}$$

$$\begin{array}{r} 3. \quad 294 \\ + 789 \\ \hline 1083 \end{array}$$

$$\begin{array}{r} 4. \quad 633 \\ + 286 \\ \hline 919 \end{array}$$

$$\begin{array}{r} 5. \quad 765 \\ + 406 \\ \hline 1171 \end{array}$$

$$\begin{array}{r} 6. \quad 7 \\ 8 \\ 4 \\ + 3 \\ \hline 22 \end{array}$$

$$\begin{array}{r} 7. \quad 7 \\ 3 \\ 5 \\ + 6 \\ \hline 21 \end{array}$$

$$\begin{array}{r} 8. \quad 14 \\ 23 \\ 16 \\ + 47 \\ \hline 100 \end{array}$$

$$\begin{array}{r} 9. \quad 21 \\ 23 \\ 74 \\ + 25 \\ \hline 143 \end{array}$$

$$\begin{array}{r} 10. \quad 17 \\ 43 \\ 23 \\ + 11 \\ \hline 94 \end{array}$$

Subtract.

$$\begin{array}{r} 11. \quad 376 \\ - 141 \\ \hline 235 \end{array}$$

$$\begin{array}{r} 12. \quad 978 \\ - 265 \\ \hline 713 \end{array}$$

$$\begin{array}{r} 13. \quad 643 \\ - 378 \\ \hline 265 \end{array}$$

$$\begin{array}{r} 14. \quad 703 \\ - 188 \\ \hline 515 \end{array}$$

$$\begin{array}{r} 15. \quad 600 \\ - 381 \\ \hline 219 \end{array}$$

Add.

$$\begin{array}{r} 16. \quad 3.81 \\ + 6.93 \\ \hline 10.74 \end{array}$$

$$\begin{array}{r} 17. \quad 17.47 \\ + 8.93 \\ \hline 26.40 \end{array}$$

$$\begin{array}{r} 18. \quad 23.45 \\ + 57.68 \\ \hline 81.13 \end{array}$$

$$\begin{array}{r} 19. \quad 59.68 \\ + 10.04 \\ \hline 69.72 \end{array}$$

$$\begin{array}{r} 20. \quad 363.00 \\ + 400.93 \\ \hline 763.93 \end{array}$$

Subtract.

$$\begin{array}{r} 21. \quad 92.64 \\ - 8.43 \\ \hline 84.21 \end{array}$$

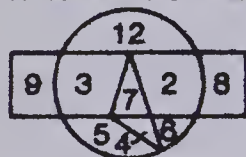
$$\begin{array}{r} 22. \quad 74.63 \\ - 3.89 \\ \hline 70.74 \end{array}$$

$$\begin{array}{r} 23. \quad 23.45 \\ - 21.62 \\ \hline 1.83 \end{array}$$

$$\begin{array}{r} 24. \quad 49.86 \\ - 10.04 \\ \hline 39.82 \end{array}$$

$$\begin{array}{r} 25. \quad 476.00 \\ - 183.41 \\ \hline 292.59 \end{array}$$

BRAINTICKLER



Find the sum of the numbers in:

- the circle. 39
- the triangle and rectangle. 33
- the rectangle but not in the circle. 17

Addition and subtraction practice 297

Using the Book Assign the Tune Up. If students have unusual difficulty with the exercises, provide appropriate remedial practice. The table below shows where the skills were presented in the text.

Exercise	Topic	Page
1-5	3-digit addition with regrouping	19
6, 7	Addition with 4 addends	15
8-10	Addition with several multidigit addends	231
11-15	3-digit subtraction with and without regrouping	23, 24
16-20	Addition of decimals—hundredths	221
21-25	Subtraction of decimals—hundredths	223

The Braintickler should provide a challenge for the better students. They will be required to isolate one figure to the exclusion of other intersecting figures and also to understand the concept of negation.

OBJECTIVE

To practise addition and subtraction

PACING

Level A All

Level B All

Level C All

ACTIVITIES

See the various addition and subtraction games and ideas in the Activity Reservoir.

EXTRA PRACTICE

Add.

$$\begin{array}{r} 1. \quad 3.1 \\ + 1.4 \\ \hline \end{array} \quad \begin{array}{r} 2. \quad 6.4 \\ + 1.3 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 3.4 \\ + 0.6 \\ \hline \end{array} \quad \begin{array}{r} 4. \quad 560.07 \\ + 309.96 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 1432.39 \\ + 2564.81 \\ \hline \end{array}$$

Subtract.

$$\begin{array}{r} 1. \quad 4.8 \\ - 3.1 \\ \hline \end{array} \quad \begin{array}{r} 2. \quad 9.6 \\ - 3.4 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 15.6 \\ - 8.7 \\ \hline \end{array} \quad \begin{array}{r} 4. \quad 413.02 \\ - 100.72 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 4732.61 \\ - 1237.08 \\ \hline \end{array}$$

Solve.

- Sandra bought a milk shake for 85¢ and a hot dog for 55¢. She paid with a \$2 bill. What change might she get back?
- Mike bought a hamburger for \$1.23. He also bought a milk shake for 87¢. He paid with a \$5 bill. How much change did he get back?

OBJECTIVE

To read a 24 h clock and to write time using 24 h notation

PACING

Level A All
Level B All
Level C All

MATERIALS

24 h demonstration clock

SUGGESTIONS

Initial Activity Discuss the need for a 24 h clock and why it is used by many transportation and business companies. (The confusion that can arise from a 12 h clock does not occur. It eliminates the need for a.m. and p.m. confusion.)

Note: The time 11:00 is read eleven hours; the time 19:00 is read nineteen hours.

ACTIVITIES

1. Obtain bus, train, or plane schedules using 24 h notation. Have students plan a trip, noting all stops and the time of arrival and departure for each point.

2. Have children find the names and type of as many business and operations as possible that use the 24 h clock.

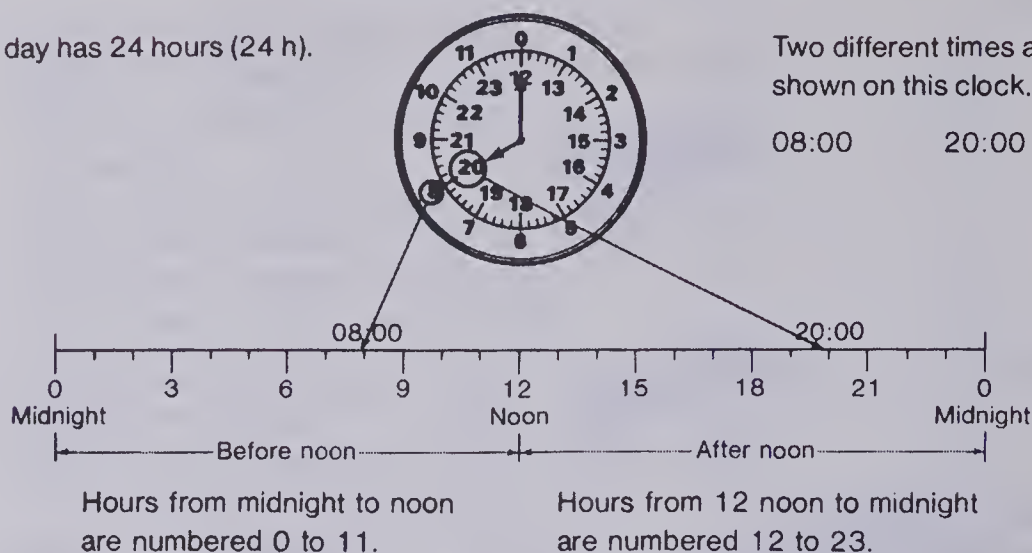
3. Play "What's My Rule?" using "Add 10, 8, 12," etc. Use "Add 12" most frequently.

The 24-Hour Clock

A day has 24 hours (24 h).

Two different times are shown on this clock.

08:00 20:00







Exercises

Choose the correct one.

- | | | | |
|-----------------------------|---------------------------------|------------------------------|--------------------------------|
| ● Mary has breakfast. 07:00 | ● Jim went to the movies. 20:00 | 3. Sabrina had supper. 18:00 | 4. Mike is sound asleep. 01:00 |
| 07:00 or 19:00? | 08:00 or 20:00? | 06:00 or 18:00? | 01:00 or 13:00? |

Record each time in two ways.

- | | | | |
|--|--|---|---|
| ●  07:15
19:15 | 6.  02:30
14:30 | 7.  10:25
22:25 | 8.  01:40
13:40 |
|--|--|---|---|

298 24-hour clock

Using the Book Examine the clock in the display and note the two different times shown on the clock.

Assign the exercises or you may do this page orally. Students can write the answers on the chalkboard for others to check.

Seconds

Seconds on a clock are read the same as minutes are.

This clock shows

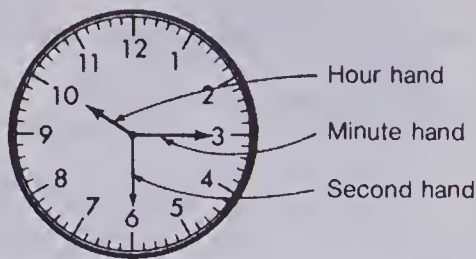
15 min and 30 s after 10 or 10:15:30.

There are:

60 s (seconds) in 1 min (minute).

60 min in 1 h (hour).

24 h in 1 d (day).



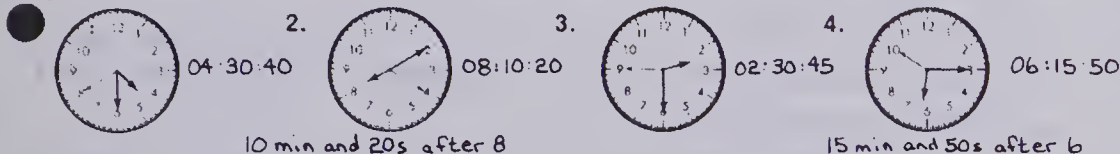
Exercises

Write each time in two forms.

For example, 15 min and 30 s after 10 or 10:15:30.

30 min and 40 s after 4

30 min and 45 s after 2



5. How many hours in each?

3 d 72 h (b) 5 d 120 h (c) 10 d 240 h (d) 30 d 720 h (e) 365 d 8760 h

6. How many minutes in each?

(a) 4 h 240 min (b) 12 h 720 min (c) 24 h 1440 min (d) 100 h 6000 min (e) 1000 h 60000 min

7. How many seconds in each?

(a) 5 min 300 s (b) 10 min 600 s (c) 60 min 3600 s (d) 100 min 6000 s (e) 1000 min 60000 s

★ 8. How many minutes in each? Hint: How many minutes in 1 h?

(a) 1 d 1440 min (b) 2 d 2880 min (c) 7 d 10080 min (d) 10 d 14400 min (e) 30 d 43200 min

Seconds 299

Using the Book Read and discuss the display with the students. Emphasize there are:

60 s in 1 min.

60 min in 1 h.

24 h in 1 d.

You may wish to do Exercises 1-4 as a group activity with students writing their answers on the chalkboard. With weaker students you may ask the students to work at the chalkboard when they do Exercises 5-7. You can then monitor their work and ask them to show how they derived each answer.

OBJECTIVE

To read and write time using seconds

PACING

Level A 1-7

Level B 1-7

Level C parts (c), (d), (e) of each of Exercises 1-7, and all of 8

VOCABULARY

Review symbols for day (d), hour (h), minute (min), and second (s).

MATERIALS

watch or clock with second hand

SUGGESTIONS

Initial Activity To provide students with some idea of the length of a second, have them count "one thousand one, one thousand two, etc." Each number takes about one second to say. Alternately they may watch the second counter on a digital watch, counting as the counter shows the seconds.

Use a watch or clock with a sweep second hand. Note the hand is usually thinner than the others, and often red.

ACTIVITIES

1. Demonstrate the use of a stop watch. When students have learned to operate and read the watch, have them (a) count one thousand one, ... to one thousand five while others time them over the interval; (b) run 15 or 20 m while being timed to relate distance and time; (c) do as many basic fact questions as possible in 15 s; etc.

2. Although seconds are not generally noted when telling time, there are certain situations when giving time to seconds is very important. Discuss with students situations where seconds are important (track and field, rocket blast off, etc.).

3. Tell students that before the 24 h clock was used extensively, we used the terms a.m. and p.m. Have them research these two terms to find their meanings and derivation.

OBJECTIVE

To use hours, days, weeks, months, years, and century as units of time

PACING

- Level A 1-5, 7, 9
- Level B 1-5, 7-9
- Level C 3-9

MATERIALS

2 calendars, one showing a leap year and one not

RELATED AIDS

HMS—DM71.
BFA PROB. SOLVING LAB II—16.

SUGGESTIONS

Initial Activity Review the familiar rhyme from Book 3:
30 days has September,
April, June, and November.
All the rest have 31
Except February, the only one
Which has 28 days clear
And 29 in each Leap Year.

ACTIVITIES

- Have the students make a display chart that can be used as a reminder of the number of days in each month.
- Students may enjoy keeping a record of all activities done during a one- or two-day period. Use 24 h notation to indicate the time for each activity.
Example
08:00 Woke up
08:00-08:10 Got dressed, brushed teeth and hair
08:10-08:30 Breakfast

3. Ask the students to add.
- | | |
|-------------------------------|-------------------------------|
| (a) 3 h 25 min
+2 h 15 min | (b) 5 h 12 min
+1 h 34 min |
| (c) 3 h 14 min
+2 h 26 min | (d) 5 h 14 min
+1 h 26 min |

Ask the students to subtract.

- | | |
|-------------------------------|-------------------------------|
| (a) 6 h 36 min
-2 h 13 min | (b) 5 h 56 min
-3 h 28 min |
| (c) 8 h 30 min
-7 h 28 min | (d) 7 h 15 min
-4 h 8 min |

Add or subtract.

- | | |
|-------------------------------|---------------------------------|
| (a) 3 h 27 min
+7 h 25 min | (b) 8 h 42 min
-6 h 26 min |
| (c) 9 h 39 min
-8 h 36 min | (d) 17 h 25 min
+16 h 14 min |

Time

There are many units used in telling time.

Jackie was born in 1970.
Diane's birthday is in February.
One week from today is a holiday.
There are 365 d (days) in 1 year.

There are 52 weeks in 1 year.
Seven days equals a week.
There are 24 h (hours) in 1 day.
There are 100 years in a century.

Exercises

- Name other ways units of time are used to tell when something happens.
● In 1980, Jan said, "I am 10 years old." In which year was she born? 1970
● In 1979, Harry said, "7 years ago I was 2 years old." In which year was Harry 2 years old? 1972
- How many days in each?
(a) 3 weeks 21 d (b) 6 weeks 42 d (c) 14 weeks 98 d (d) 52 weeks 364 d
- How many hours in each?
(a) 3 d 72 h (b) 6 d 144 h (c) 10 d 240 h (d) 30 d 720 h (e) 365 d 8760 h
- How many hours in each?
Hint: How many hours in 1 d?
(a) 1 week 168 h (b) 2 weeks 336 h (c) 10 weeks 1680 h (d) 50 weeks 8400 h (e) 52 weeks 8736 h
- Name the months of the year in order starting with January.
- Name the 3rd month, the 6th month, the 8th month, the 12th month.
March June August December
- How many days in each month?
(a) January 31 d (b) February 28 d (c) June 30 d (d) December 31 d
(29 d in a Leap Year)

300 Hours, days weeks, months, year

Using the Book Discuss the display emphasizing the interrelationships among the units. You may wish to do Exercises 1, 2, 4(a), and 5(a) orally in order to help the weaker students.

ANSWERS

7. January, February, March, April, May, June, July, August, September, October, November, December

EXTRA PRACTICE

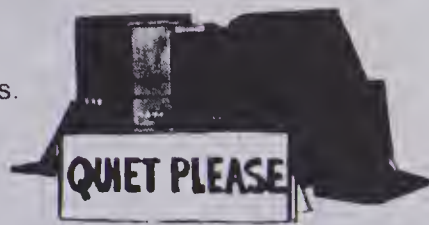
- See DM71.
- (a) How many months in a century?
(b) How many days in a century? (Do not count the extra days in Leap Years.)
(c) How many weeks in a century?
- What is the average number of hours you are in school in (a) one day? (b) one week? (c) one year?

What is the average number of hours you watch television in (a) a week? (b) a month?

- How many hours in (a) January? (b) February? (c) December? (d) September?
- How many days in the last 6 months of the year? in the first 6 months? How much difference is there in the first 6 months and the the second 6 months of the year?

Librarian

A librarian often looks up information for customers.



1. How many years ago?
 - (a) Canada became a country in 1867.
 - (b) Manitoba became a province in 1870.
 - (c) Orville and Wilbur Wright flew the first airplane in 1903.
 - (d) Banting and Best, two Canadian doctors, discovered insulin to treat diabetes in 1922.
 - (e) The pendulum clock was invented in Holland in 1657.
2. Alexander Graham Bell invented the telephone in 1876.
Marconi sent the first radio message across the Atlantic in 1901.
The message was received in St. John's, Newfoundland.
How many years were there between the two events? *25 years*
3. How many years ago?

<ol style="list-style-type: none"> (a) 410, first lady of mathematics, Hypatia. (b) 820, one of the first books on algebra written. (c) 1096, First Crusade. (d) 1202, 1, 1, 2, 3, 5, 8, 13, ... Fibonacci first recorded this sequence. (e) 1349, Black Death killed a large part of Europe's population. (f) 1492, first printed arithmetic book (in Italy). 	<ol style="list-style-type: none"> (g) 1519, Leonardo da Vinci dies. (h) 1608, telescope invented. (i) 1637, Descartes uses co-ordinate system. (j) 1867, Canadian Confederation. (k) 1916, Einstein does some of his most important work — relativity. (l) 1969, first man on moon — Lovell. (m) 1977, space probe launched to Venus.
--	---

Problems, time line 301

Using the Book Discuss the importance of knowing the present year when solving problems involving time. Also review the importance of deciding the pertinent information in this type of problem. Read through the word problems once or twice. There are many words and names (see Vocabulary) that will be new to the children. Be certain they know how to record their answers in their workbooks.

OBJECTIVE

To solve word problems involving time

PACING

Level A All
Level B All
Level C All

VOCABULARY

insulin, diabetes, pendulum, invented, algebra, population, telescope, co-ordinate system, relativity, (plus the various proper names)

RELATED AIDS

HMS—DM72.

SUGGESTIONS

Initial Activity See the "Career Awareness" notes in the Chapter Overview, page 280.

Discuss some of the responsibilities and duties of a librarian.

Have students list some of the major headings and numbers found in libraries which help people find information.

ACTIVITIES

1. Have students make for display a large timeline that features important events.
2. Ask the librarian in the school to talk to the class about the type of work that is done in the library (buying, sorting, shelving books, timetables, displays, library helpers or monitors, etc.). This might be incorporated into a discussion review of how to use the library, etc.
3. Have the students research the age of each province (i.e., the year each joined Confederation). On a map of Canada, have them put the year each province joined Confederation or show the ages of the provinces in a bar graph.

EXTRA PRACTICE

See DM72.

OBJECTIVE

To evaluate achievement of the chapter objectives

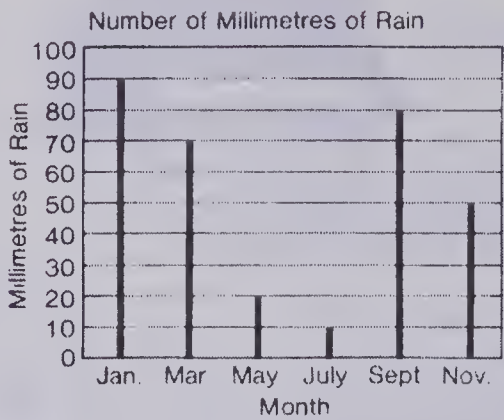
PACING

- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS—DM73.

Chapter Test

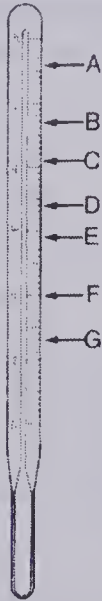


1. (a) In which month was the rainfall 50 mm? November
(b) Which month had the least rainfall? July
(c) How much rain fell in November? 50 mm
(d) In which month was there seven times as much rain as in July? March

2. Number of cars in a national park with licence plates recorded by province.
Draw a segment graph to show the information.

3. Record the temperatures indicated by the letters:
A, B, C, D, E, F, G.

5. Copy and complete.
60 min = 1 h
60 s = 1 min
7 d = 1 week
365 d = 1 year



Province	Number
British Columbia	500
Alberta	750
Saskatchewan	225
Manitoba	350
Ontario	900

4. Mark's temperature was 39.3°C. It dropped 2.4°C. What is his temperature now? 36.9°C
6. Record the time in two ways.



08:20
20:20

302 Chapter 10. test

Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a large number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 280).

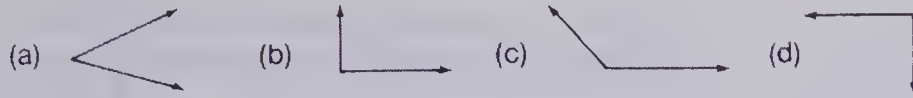
An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1, 2	A	281-289
3, 4	B	292-295
5	C	299, 300
6	D	298

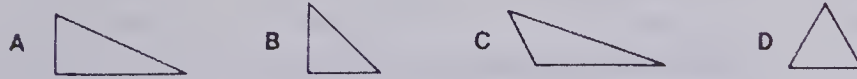
ANSWERS
3. A-- 39.6°C, B-- 38.7°C, C-- 38.1°C, D-- 37.4°C, E-- 36.9°C, F-- 36°C, G-- 35.3°C

Cumulative Review

1. Which angles are right angles? (b) and (d)

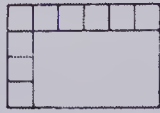


2. Which shapes are congruent to shape A? none



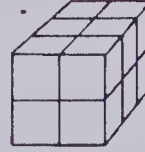
3. Calculate the area.

24 square units



4. How many cubic units?

12 cubic units



5. Round to the nearest multiple of 10.

(a) 238.2 240 (b) 241.3 240

6. Change each to a decimal.

(a) $\frac{3}{5}$ 0.6 (b) $\frac{7}{10}$ 0.7

Add.

$$\begin{array}{r} 7. \quad 215 \\ 139 \\ 654 \\ + 190 \\ \hline 1198 \end{array}$$

$$\begin{array}{r} 8. \quad 5231 \\ 602 \\ 59 \\ + 1003 \\ \hline 6895 \end{array}$$

Subtract.

$$\begin{array}{r} 9. \quad 3145 \\ - 1902 \\ \hline 1243 \end{array}$$

$$\begin{array}{r} 10. \quad 345.6 \\ - 29.9 \\ \hline 315.7 \end{array}$$

Multiply.

$$\begin{array}{r} 11. \quad 84 \\ \times 23 \\ \hline 1932 \end{array}$$

$$\begin{array}{r} 12. \quad 631 \\ \times 36 \\ \hline 22716 \end{array}$$

Divide. 904 R3

$$13. \quad 8 \overline{)7235}$$

766 R2

$$14. \quad 6 \overline{)4598}$$

Estimate the answers by rounding each number to the nearest 10.

15. 76×33 2400 16. 139×48 7000 17. 61×23 1200 18. 39×78 3200

OBJECTIVE

To review and test selected concepts and skills previously covered

PACING

Level A All
Level B All
Level C All

Using the Book This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a large number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or refer to an appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1	193
2	310
3	269
4	276
5	233
6	238
7, 8	231
9	42
10	224
11	252
12	256
13, 14	261
15-18	255

CHAPTER 11 OVERVIEW

This chapter introduces geometric concepts of the centre and circumference of a circle, parallel and perpendicular lines, angles and types of triangles. In transformation geometry, the lessons concerning slides, turns, and flips include opportunities not only to recognize these relationships, but to draw them as well. Graphing is extended to include ordered pairs on a coordinate plane.

OBJECTIVES

- A To identify and draw circles, parallel and intersecting lines, rays, and angles
- B To identify types of triangles and congruent shapes
- C To identify and draw slides, turns, and flips
- D To introduce the coordinate plane and the ordered pair notation; to locate a point given the ordered pair; to name the ordered pair for a point

BACKGROUND

The geometry in this chapter is introduced informally rather than through precise definitions. Ample opportunity should be provided for students to do the suggested activities and to develop the concepts through the use of concrete materials and pictorial representations. Opportunities for students to experience slides, turns, and flips in free space and then through the use of concrete objects should be provided before moving to paper-and-pencil activities.

Street maps are used to introduce the concept of graphing on a coordinate plane. The lessons in this chapter use the conventional approach to naming a location: to first name the horizontal distance (left to right), then the vertical distance (bottom to top). The use of maps to present this topic builds on what should be prior experience and offers an ideal opportunity to apply learned mathematical skills to the immediate

environment. Using ordered pairs to locate a position on a grid is then presented in similar fashion: “move over ____ units; move up ____ units.

MATERIALS

string
cardboard strips of various lengths
compasses
round objects for tracing
rulers
tracing paper, plain paper
cardboard arrows and paper fasteners
grid paper — 2 cm square
dot paper — 2 cm and 1 cm
irregular shapes to trace
scissors
blocks or centimetre cubes
plastic mirrors

CAREER AWARENESS

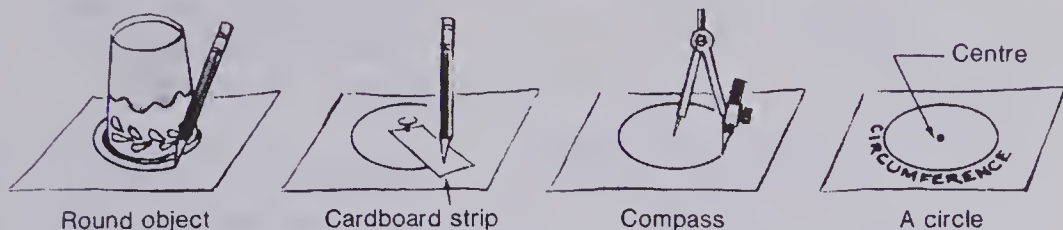
City Designer [322]

City designers combine many talents.

They must be creative in designing attractive, original communities or in redesigning existing ones. They must have the basic engineering skills to know what is possible, practical, and feasible. They must be familiar with principles of traffic flow, educational needs, commercial and industrial requirements, and climatic influences (such as prevailing winds). Parks and recreational needs, sources of water supply, sewage facilities, and natural drainage are also all important aspects of city and urban planning.

City designers must be able to plan for tomorrow, as well as today. They work in conjunction with civic government engineers and contractors to develop a community design that is and will be acceptable to all.

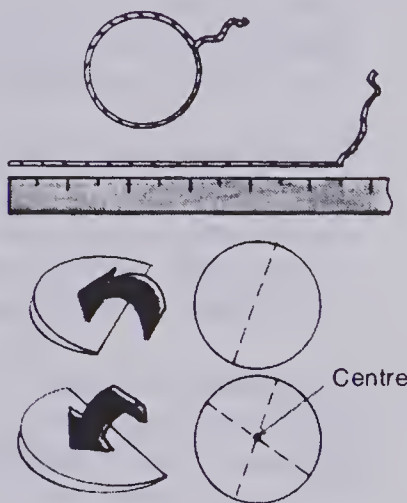
Drawing Circles



The distance around a circle is the **circumference** of the circle.

Exercises

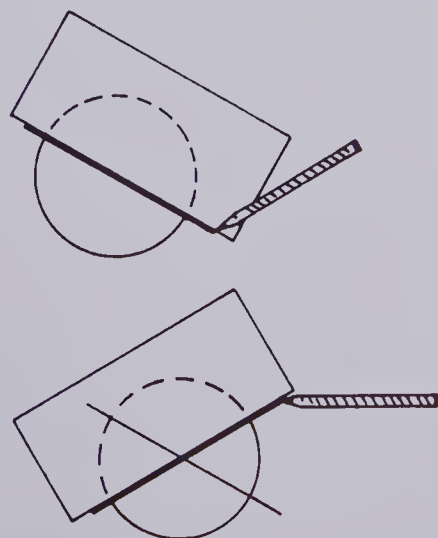
1. Draw a circle each way.
2. Mark the centres of your circles.
Can you mark all three centres? Explain.
3. Draw another circle.
Place a piece of string around the circle.
How long is the string?
4. Draw a circle. Cut it out.
Fold the circle. Open it.
Fold it in another place.
Mark where the two fold lines cross.
Mark the **centre** of the circle.



Circle, centre, and circumference 305

Using the Book Discuss the display and have students draw circles in the 3 ways illustrated (Exercise 1). Illustrate carefully how to use a compass. Many students will need ample practice in order to become proficient in the use of the compass. As students are drawing a circle with the cardboard strips, emphasize that the distance from the centre to the circle is always the same. Students may be unable to find the centre of circles drawn using the round object (Exercises 2 and 4). Therefore, a method is provided (Exercise 4). Emphasize that the circumference is the distance around the circle, hence we measure it.

An alternate method requires the use of semitransparent plastic mirrors. Place the mirror across the circle so that one half is reflected to match the other half. Draw a line segment across the circle. Repeat for another segment. The centre is the point where the two line segments (i.e., diameters) meet.



OBJECTIVE

Having drawn circles, to locate and identify the centre and to measure the circumference

PACING

Level A All
Level B All
Level C All

VOCABULARY

circumference

MATERIALS

string, cardboard strips, compasses, round objects (glass, bottle lids, etc.)

BACKGROUND

A circle is a set of points, all of which are a fixed distance from a point called the centre.

SUGGESTIONS

Initial Activity Discuss circles with the students naming places where they see or know of circles. You may also wish to review the relationship between circles (plane shape) and spheres, cones, and cylinders (solid shapes) as presented on page 200.

ACTIVITIES

1. Using round objects (garbage can, jar lid, etc.), put an identification mark on the circumference and roll the object one complete revolution (back to the mark). Have the children measure and record the circumferences.

2. Compile a bulletin-board list of objects that suggest a circle. Students may wish to illustrate the list with art of pictures cut from magazines.

3. The children may enjoy drawing circle patterns (preferably using compasses). When coloured they can make an interesting bulletin-board display.

★4. Ask the students to draw 3 points to represent telephones (not in a straight row). How many lines are necessary to connect all the phones on separate lines? (3) Repeat for 4 phones, 5 phones, 6 phones, etc. (6, 10, 15)

OBJECTIVES

To identify intersecting and parallel lines

To draw parallel lines by the two methods shown

PACING

Level A 1-6

Level B All

Level C All

VOCABULARY

parallel

MATERIALS

ruler, tracing paper

SUGGESTIONS

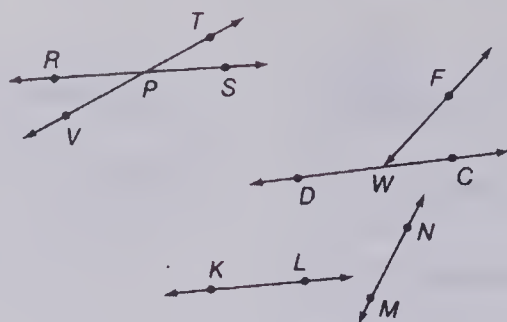
Initial Activity Review the proper use of a ruler to (a) measure the length of a segment and (b) draw a segment of a given length. Emphasize the need for accuracy in measuring distances.

ACTIVITIES

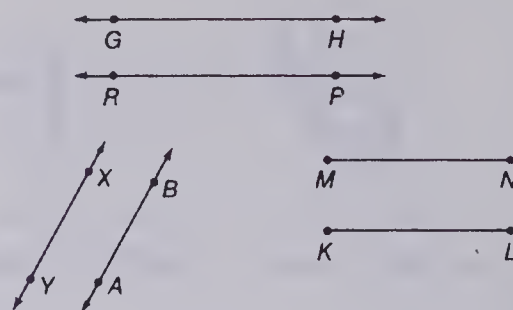
1. Relate the terms "parallel" and "intersection" to real-world situations. Generally, city streets run parallel to one another; streets and avenues intersect one another. Also train tracks, trolley wires, highway telephone wires, etc. are parallel. Have students draw pictures of parallel and intersecting lines.

2. Provide each pair of students with a geo-board and elastic bands. Each student in turn is to make a line (segment) without intersecting another line. One point is recorded for each pair of parallel lines.

Parallel Lines



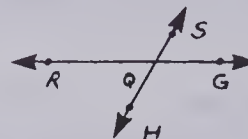
These pairs of lines cross each other.



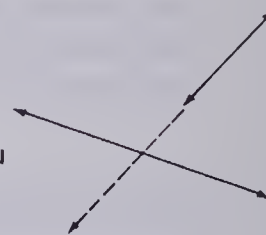
When two lines or line segments never cross, we say the lines are **parallel**.

Exercises

1. Draw a line RG .
Draw line SH so that it crosses line RG .
Put a Q where they cross.



2. Look at these lines.
● Do they cross? (Remember: Lines go on forever!) **yes**
(b) We can show more of the lines by making the part you see longer. Do they cross now? **yes**
(c) Do these two lines cross? **yes**



3. Look at these two lines.
(a) Do they cross? **yes**
(b) Imagine more of the lines showing.
Do they cross? **yes**



306 Intersecting and parallel lines

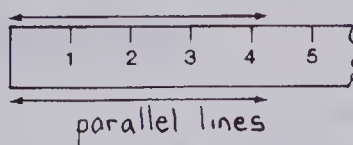
Using the Book Discuss intersecting and parallel lines as shown in the display. Remind the student that the arrow tips on a line indicate that the line goes on forever. Because we cannot ever hope to draw a whole line, we draw only part of the line and put arrows on it. Sometimes we must extend the line to see if it will intersect another line.

In Exercises 1-3, you may wish to have the students trace the lines on a separate sheet of paper so that they can draw on their copy.

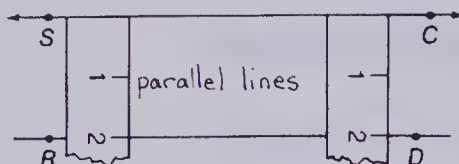
In Exercises 4 and 5, emphasize the two aspects of parallel lines: (a) they never meet or cross and (b) the distance between the lines is always the same. Discuss with the students the effect of using an uneven ruler in Exercise 4.

In Exercises 6-8, as a check, have students measure the distances in two places between the lines that they think are parallel (see Exercise 3).

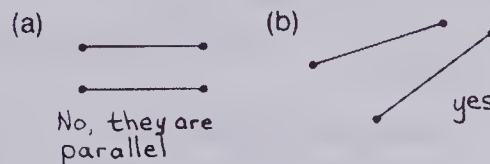
4. Place your ruler on your page.
Draw a line along each edge.
These lines will never cross.
Label them **parallel lines**.



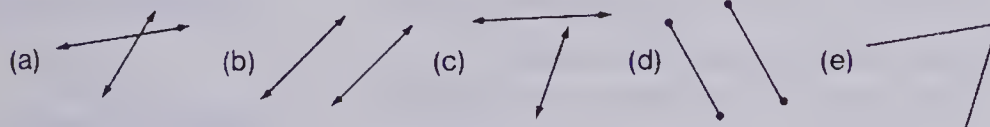
5. Draw line SC.
Draw RD 2 cm from the first.
Will the two lines ever cross? no
Label them *parallel lines*.



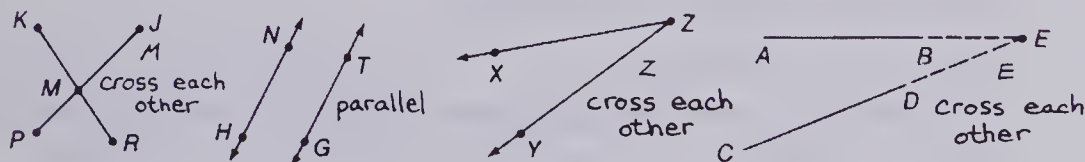
6. Look at these segments.
If you make them longer,
will they ever cross?
Do these segments look parallel?



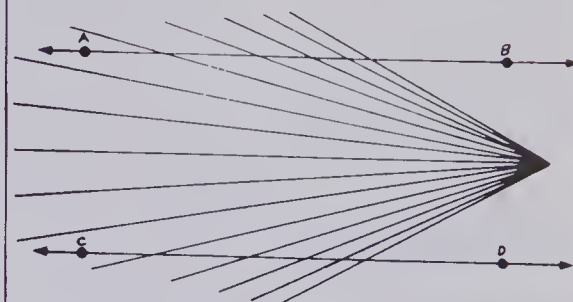
7. Which pairs:
● are parallel? (b), (d) (ii) cross each other? (a), (c), (e)



8. Name the common point where there is one.
Which are parallel? Which cross each other?



3. Have the children help in the preparation of a display of optical illusions. Many can be found using the library. When enlarged, these will make an attractive bulletin-board display. The "parallel? — not parallel" illusion shown can be used as a start.



Are lines *AB* and *CD* parallel? (yes)

OBJECTIVES

To identify and draw rays

To develop the concept of an angle as the rotation of a ray from its initial position

PACING

Level A 1-5

Level B All

Level C All

VOCABULARY

fasten(er), ray

MATERIALS

cardboard strips with arrowheads on one end, paper fastener

SUGGESTIONS

Initial Activity Ask each pair of students to construct an angle-maker given two strips of paper and a paper fastener. Discuss the method of using the angle-maker to make angles. Note in particular that as the arms open (rays of angle) the angle gets larger. To make an angle, the student traces between the arms of the angle-maker.

ACTIVITIES

1. Ask the students to draw as many types of angles as they can think of (it is the measure which will vary). Discuss how the angles that have been drawn differ.

2. Make a bulletin-board display of angles in the community. Students may bring pictures. On each picture use a felt pen to emphasize the angle.

3. As an extension, you may wish to prepare a "naming activity". Introduce naming symbols such as:

\overline{AB} = segment AB

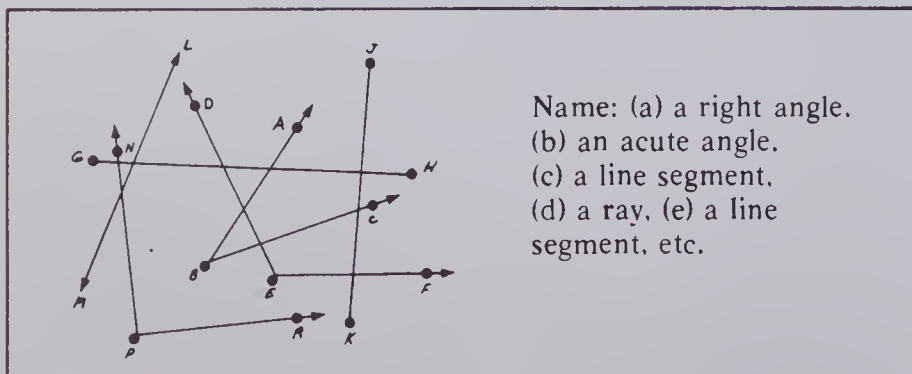
\overleftrightarrow{AB} = line AB

\overrightarrow{AB} = ray AB

$\angle ABC$ = angle ABC

$\angle B$ = angle B (if there is no chance of confusion)

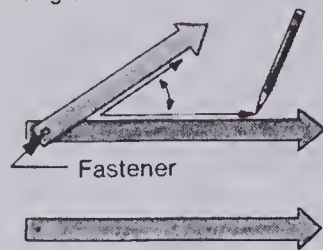
Prepare a large, coloured activity card as shown.



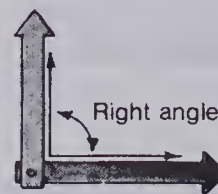
Name: (a) a right angle.
(b) an acute angle.
(c) a line segment.
(d) a ray, (e) a line segment, etc.

Angles

An angle-maker



This represents a ray.
Make two and fasten them.



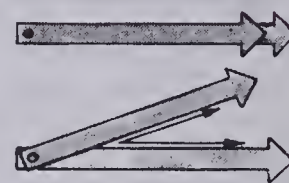
A line is an example of a special angle.

Exercises

1. Construct an *angle-maker*.
Use it to draw three angles.

Start with the two rays of the angle-maker closed.

2. Open the rays to form a small angle.
Trace the angle. Remember to put arrowheads on the rays.
3. Open the rays further. Trace.
4. Open the rays to make a *right angle*. Trace.
5. Open the rays to make a line.



6. Draw a *segment*. Tell one way a segment differs from a ray. A segment has 2 endpoints. A ray has only 1 endpoint and it goes on forever in 1 direction.

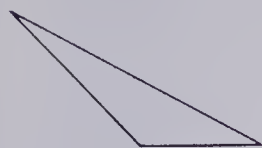
308 Segments, rays, and angles

Using the Book Discuss with the students the features of a ray: it has one end (endpoint) and the line goes on and on in one direction only. We put the arrowhead on the cardboard strip to indicate this. The strips form only a model of an angle.

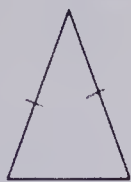
You may wish to introduce the terms "acute" angle and "straight" angle with some students.

Types of Triangles

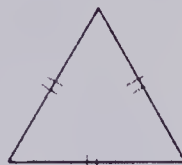
Triangles identified by the lengths of the sides.



No two sides congruent



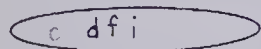
2 sides congruent



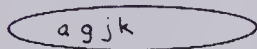
3 sides congruent

Exercises

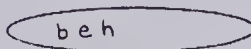
1. Draw three loops and label as shown. Put the letter of each shape in the right loop.



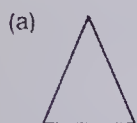
No two sides congruent



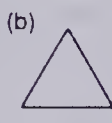
2 sides congruent



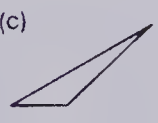
3 sides congruent



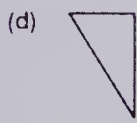
(a)



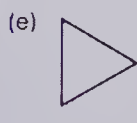
(b)



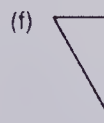
(c)



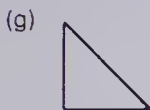
(d)



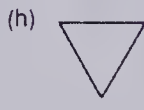
(e)



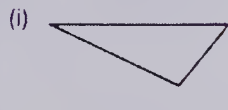
(f)



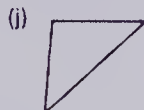
(g)



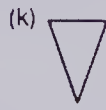
(h)



(i)



(j)



(k)

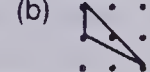
2. Describe each type of triangle.

2 sides congruent



(a)

no 2 sides congruent



(b)

3 sides congruent



(c)

2 sides congruent



(d)

Types of triangles 309

Using the Book Have children look at the display at the top of the page.

Emphasize that slash marks (shown in red) can be used to show congruence in triangles as well as in 4-sided shapes.

For Exercise 1, you may wish to have some students (a) trace and cut out the shapes, and (b) place them in three labelled loops drawn on construction paper.

For Exercise 2, the students should be instructed to identify the triangles by counting dots on each side. Besides cautioning the children as to what to do with diagonals, be certain they understand the instructions and how to respond in their workbooks.

ACTIVITIES

1. If geo-boards are available, have students make triangles and identify some of each type.

2. Have students make triangles from cardboard strips of various lengths. See if students can discover that the sum of the two shortest sides must be greater than the longest side to make a triangle.

3. To provide further practice in recognizing congruent segments and

sides within a shape prepare:

- (a) 3 containers labelled "no sides or lengths congruent"; "2 sides or lengths congruent"; "3 sides or lengths congruent".

(b) Index cards, each one showing a capital letter or numeral from this set—A, E, F, H, K, L, M, N, R, T, V, W, X, Y, Z, 4, 5, 7 (or use appropriate cards from "The Relation Game" in the Activity Reservoir).

- (c) Index cards showing various 3- and 4-sided plane shapes.

OBJECTIVES

To identify three types of triangles: no sides equal, 2 sides equal, and 3 sides equal

To sort triangles according to given rules

PACING

Level A 1

Level B 1

Level C All

MATERIALS

paper suitable for tracing (optional), labelled loops as shown in Exercise 1 (optional)

RELATED AIDS

HMS—DM74.

BACKGROUND

We can identify triangles by comparing the lengths of their sides. If no two sides of a triangle are equal, the triangle is scalene. If a triangle has two equal sides it is isosceles. If all three sides are equal, the triangle is equilateral. (It is not necessary to stress the proper names of the types of triangles at this time.)

SUGGESTIONS

Initial Activity Review the meaning and notation for congruence as dealt with on pages 187 and 188. Draw several squares and rectangles on the chalkboard. Have individuals indicate congruent sides and use slash marks to note them for the group.

Have a student sort the cards into their appropriately-labelled containers and give to a classmate who checks and reshuffles for the next twosome.

4. Prepare an activity card such as:

What closed shape can you make with three sticks?
Make lots of separate triangles.
Make a table, like this:

Triangles	1	2	3	4	5	6	7	8	9	10
Sticks	3	6								

Can you use the table to write multiplication, division, and fraction equations?

OBJECTIVE

To identify congruent shapes

PACING

Level A 1-6, 8

Level B 1-6, 8

Level C All

VOCABULARY

geo-paper, geo-board

MATERIALS

irregular shapes (cardboard), geo-
(dot)paper (DM75), geo-boards

RELATED AIDS

HMS—DM75 and DM76.

SUGGESTIONS

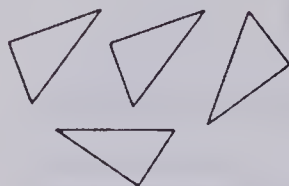
Initial Activity Give the students an irregular shape (e.g., scalene triangle). Ask them to trace it, then slide (flip or turn) it and trace it again. Ask if (a) the size has changed, (b) the shape has changed. Point out that two shapes that are the same size and shape are **congruent** shapes. (The positions may be different.)

ACTIVITIES

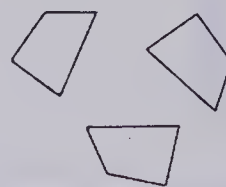
1. Repeat Exercise 8 using dot paper.
2. Provide dot paper (DM75) and index cards. Have the students create their own matching activity as shown in Exercises 4, 5, and 6.
3. Have the student make a shape *congruent* to a given shape but on different sized dot paper. This is a lead-up to scale drawing and will be too difficult for some students.

Congruent Shapes

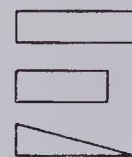
Congruent shapes have the same size **and** shape.



Congruent shapes



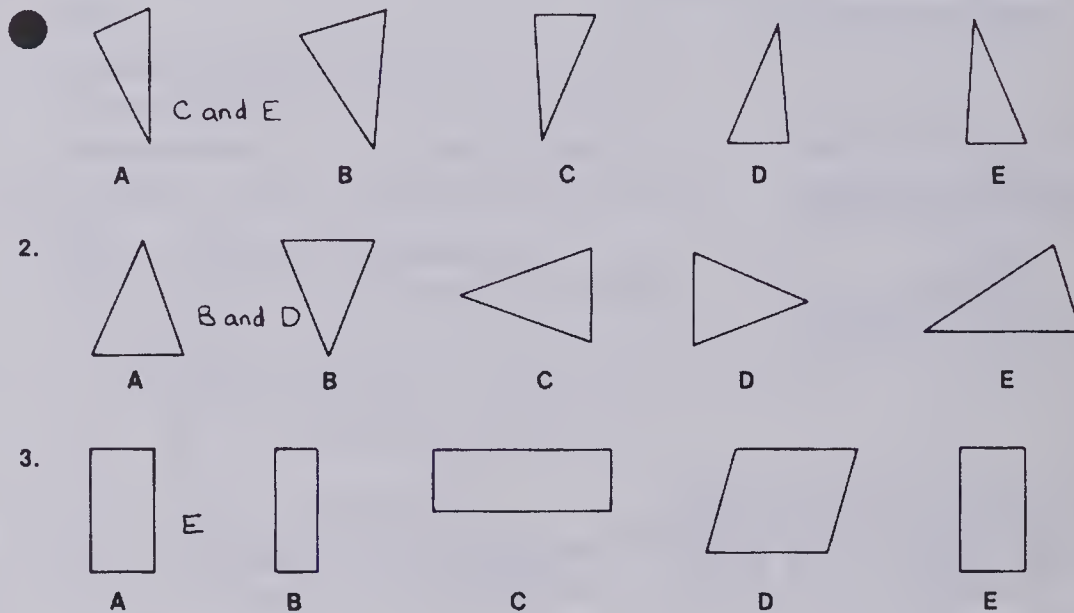
Congruent shapes



Not congruent shapes

Exercises

Trace and cut out shape A. With which shapes is it congruent?



310 Congruent shapes

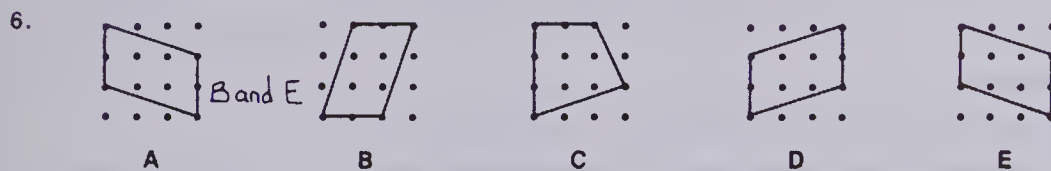
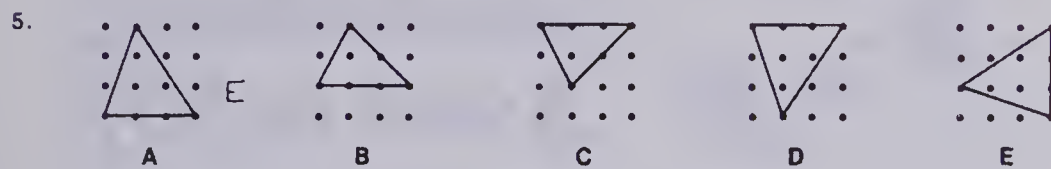
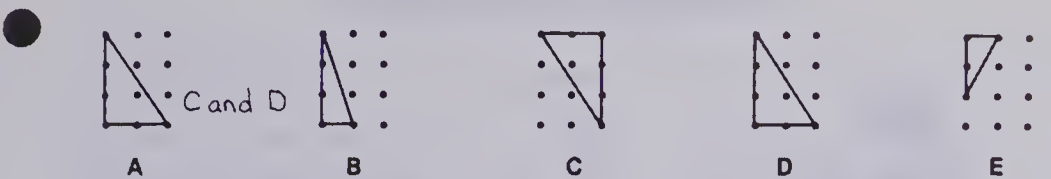
Using the Book Have the students trace and cut out 1 of each of the 3 different shapes in the display. Use the cutouts to show congruence within each set.

Discuss corresponding (matching) sides of those shapes which appear to be congruent. Some students will still have to trace the figure or measure to do this, others can count dots.

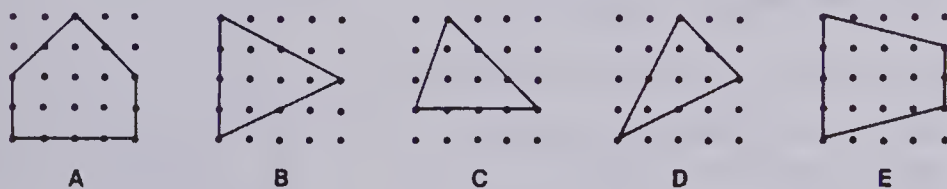
Be certain that the children understand the instructions for Exercises 4, 5, and 6. The answer for Exercise 4 is in the back of the book.

For Exercise 8 you may wish to define a scoring system to help determine what constitutes the "winner".

Which shapes are congruent to shape A?



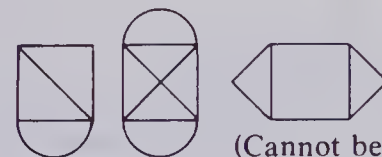
7. On geo-paper, draw a shape congruent to each.



8. Choose a partner.
Make a shape on your geo-board.
Ask your partner to make a shape congruent to yours.
Who is the winner after 10 turns each?

4. Draw the following figures on the chalkboard. Ask the students to draw them in their books. Then direct them to trace each figure following these rules:

- do not lift your pencil.
- do not retrace any line.



(Cannot be done.)

Children may enjoy making their own "no lift—no trace" designs as challenges for classmates.

OBJECTIVE

To develop intuitively the concept of a slide

PACING

Level A All
Level B All
Level C All

BACKGROUND

In a slide, the object being moved does not change its size or shape. Only position changes. It does not turn or flip over.

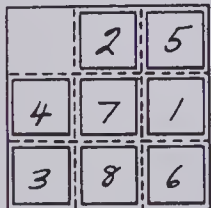
SUGGESTIONS

Initial Activity Give the children the opportunity to slide on the gym floor. Discuss sliding on the hockey rink, on a slide, skiing downhill, etc., noting that the size and shape do not change from start to finish (unless one falls, trips, etc.).

ACTIVITIES

1. Have the child find examples of slides in the real world (roof top gables, stepping stones, fence posts, floor tiles, school windows, etc.). Make a bulletin-board display of slides.

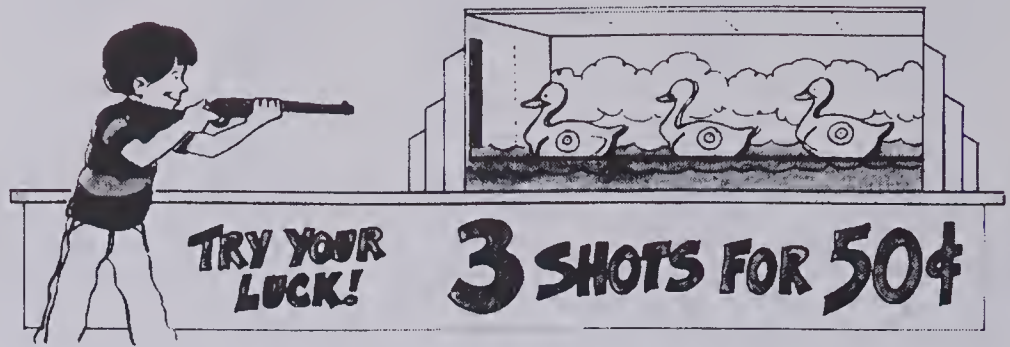
2. Play "Slides" by preparing 8 cards (each one 3 cm × 3 cm) placed on a 9 cm × 9 cm square as shown.



Heavy cardboard cards are best. The object of the game is to rearrange all 8 cards in correct order by sliding only 1 card at a time. Cards may *not* be lifted, turned, flipped, or slid outside of the 9 cm square.

3. Vary the game "Slides" by (a) increasing the number of cards and size of square (i.e., 15 cards on a 16 cm square) and/or (b) altering the card labels (i.e., instead of just whole numbers shown, use: (i) fractions or (ii) whole numbers increasing by tens or (iii) decimals or (iv) a combination of fractions, decimals, and whole numbers, etc.).

Shooting Gallery



The ducks **slide** across the tent.

Exercises

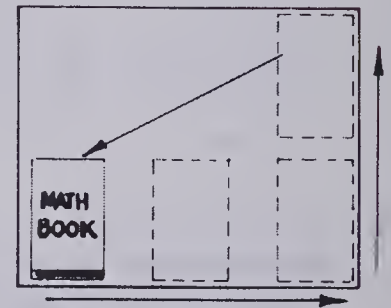
- Does the duck change shape as it moves along? no
- Does the duck change size as it moves along? no
- 3. Does the duck turn as it moves along? no
- 4. What does change? the position

Slide a book along the lower edge of your desk.

- 5. Does the book change shape? no
- 6. Does the book change size? no
- 7. Does the book turn? no
- 8. What does change? the position

Slide the book *up* along the side edge of the desk.

- 9. Answer Questions 5 to 8 for this slide.



312 Slides: real objects

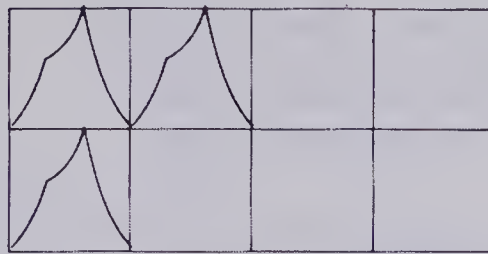
Using the Book Provide ample opportunity for the child to "tell" what is happening — that nothing but position changes. Be certain to provide the child with opportunities to *experience* slides by actually doing the things suggested.

ANSWERS

- 9. The book does not change size or shape. It does not turn. Only the position changes.

Drawing Slides

- Trace this shape.
Cut it out.
Place the pattern on the first square of squared paper. Trace.
Slide one square to the right. Trace.
Repeat for the other squares.
Return the pattern to the first square.
Slide it down and repeat.



- Use dot paper.
Copy the shape.
Make a pattern by repeating the shape after a *slide* of 2 units.
Repeat the pattern by sliding the shape *down* 2 units.
Colour your pattern.



Slides squared paper 313

OBJECTIVE

To draw shapes on squared and dot paper to illustrate slides

PACING

Level A All
Level B All
Level C All

MATERIALS

grid and dot paper (2 cm squares or use DM75 and DM77), paper for cutouts, scissors

RELATED AIDS

HMS—DM75 and DM77.

ACITIVITIES

- Have students make and cut out their own shapes to slide and trace on grid paper. Vary the slide instructions (slide 2 and trace; slide over 1 and down 1 and trace, etc.).
- Make wallpaper patterns (flower cutouts, etc.) using slides.
- Counting by twos, threes, etc. can be practised by having the students colour or number every second (third, etc.) shape.

Using the Book In Exercise 1, note that 1 side of the shape lies along 1 side of the square so the student has a point of reference and won't turn the shape before tracing.

For both squared paper and dot paper exercises, emphasize that the size and shape of the objects do not change. Talk about corresponding parts of the shapes.

OBJECTIVE

To develop intuitively the concept of turns

PACING

Level A All
Level B All
Level C All

MATERIALS

plain paper, paper for cutouts, scissors

BACKGROUND

In a turn, the object being turned does not change its size or shape. Only the position and attitude change. Do not use the word "attitude" with students. Describe the attitude by using expressions such as "standing on one's head, on one's hand, upright, etc."

SUGGESTIONS

Initial Activity Give children the opportunity to turn in free spaces. Right turn ($\frac{1}{4}$ turn) and about turn ($\frac{1}{2}$ turn) are terms most students are familiar with and actions they can do.

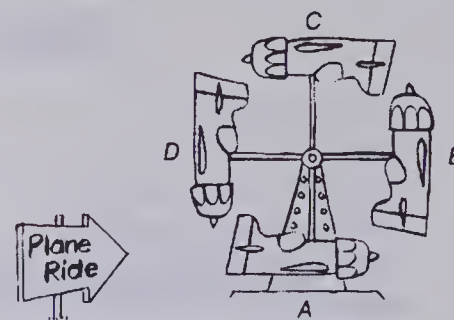
Discuss common things that turn (clock hands, door knobs, etc.). You may talk about things that turn around (these are turns) but do not let the students say turn over (these are flips, page 318).

ACTIVITIES

1. Have the students make shapes that can be traced on plain paper, turned, then traced again. Have students identify congruent (same) parts of the figures when they have been turned and traced.

Turns

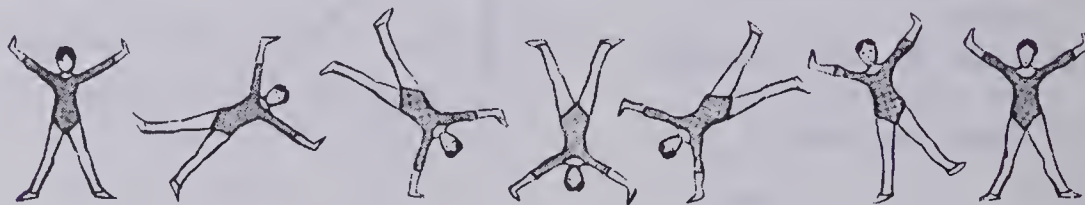
At the fair, Gladys and Romaine had a ride on Loop-da-Plane. They got in when it was at A. The plane started to **turn**.



Exercises

- Which way, left or right, were they facing when they got in at A? right
- When they were at B, after $\frac{1}{4}$ turn, which way did they face — up or down? up
- 3. When they were at C, after $\frac{1}{2}$ turn, which way did they face? left
- 4. When they were at D, after $\frac{3}{4}$ turn, which way did they face? down

Gladys and Romaine watched the gymnasts. One gymnast made a *turn* like this.



In the *turn*,

- 5. Does the gymnast change shape? no
- 6. Does the gymnast change size? no

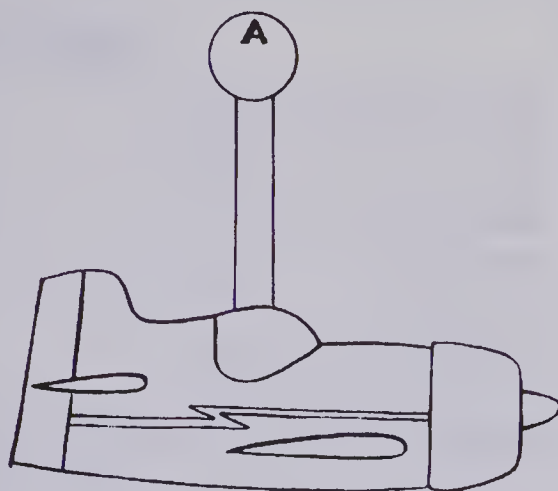
314 Turns real objects

Using the Book Proceed slowly providing ample opportunity for students to experience and discuss the activities on these two pages. Let students explain what happens, what stays the same, what changes, etc.

In Exercises 1-4, emphasize the direction they are facing from our point of view: to the right; up; to the left; down.

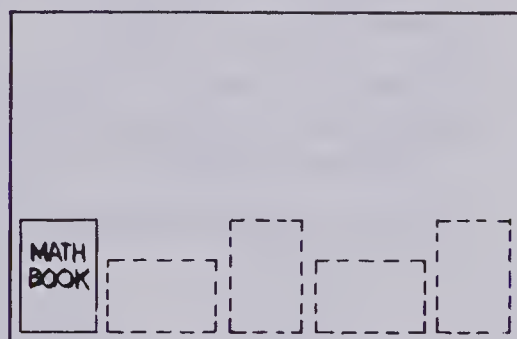
In Exercise 7 tell students it is only the plane we are interested in. Trace the plane but do not trace the stem. The stem is there only to help locate the plane's position.

7. Make a picture to show a turn.
Trace and cut out this plane.
Trace the pattern in your book.
Place a pencil point at A and
turn the plane $\frac{1}{4}$ turn. Trace.
Repeat for $\frac{1}{2}$ turn and $\frac{3}{4}$ turn.
Make other patterns.



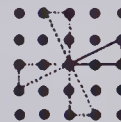
8. Name as many examples of *turns* as you can.

9. Use your math book.
Place it on the corner of
your desk as shown.
Turn the book along the
edge of the desk.
(a) Does the size of the
book change? *no*
(b) Does the shape of the
book change? *no*
(c) What does change? *the position*
(d) Can you think of another
way to *turn* the book?



2. Provide each pair of students
with a geo-board (or dot paper). Using
the centre pin and two other pins a
student makes a triangle. The second
player makes another triangle to show a
turn.

Example



3. Have the children make
patterns using slides and/or turns. Use
cardboard templates for tracing and
colouring. Effective slide-turn designs
can also be made using potato halves
cut to shape (diamond, triangle, etc.)
and used with ink or paint as a stamp.

OBJECTIVES

- To draw shapes on squared paper and dot paper to illustrate turns
- To practise multiplication and division of whole numbers
- To practise addition and subtraction of decimals

PACING

- Level A All
- Level B * All
- Level C All

MATERIALS

2 cm squared paper (DM75), dot paper (DM77), paper, scissors

RELATED AIDS

HMS—DM75 and DM77.

BACKGROUND

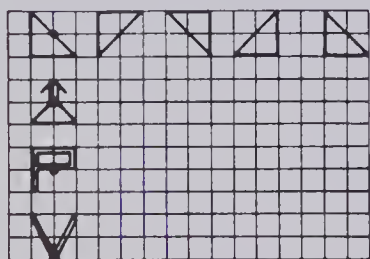
A turn centre is a point about which a figure turns. The turn centre can be within, on the outside edge of, or completely outside of the figure. All turn centres on these pages are of these last two types.

ACTIVITIES

1. If you have not already done so, see the activities for pages 314 and 315.

2. Prepare an activity as shown.

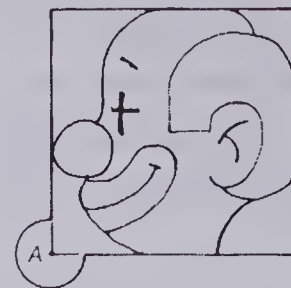
Draw each pattern on squared paper as shown. Then draw each as it would appear after $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and full turns. The first is done for you.



3. Extend the activity suggested above by providing wider graph paper and asking for $1\frac{1}{4}$ and $1\frac{1}{2}$ turns, etc.

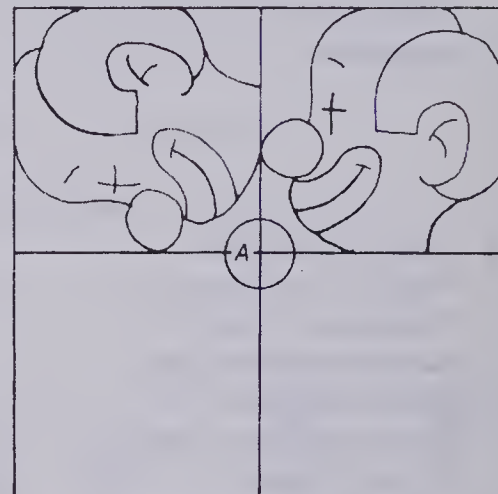
More Turns

Trace and cut out this shape.
Place it on grid paper as shown.
Trace
Place pencil on dot at A.
Make $\frac{1}{4}$ turn.
Trace again.
Repeat for $\frac{1}{2}$ turn and $\frac{3}{4}$ turn.

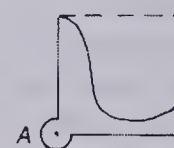
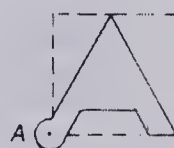


Exercises

- Which way was the clown facing when you started? left
 - Which way was he facing after $\frac{1}{4}$ turn? down
 - Which way was he facing after $\frac{1}{2}$ turn? right
 - Which way was he facing after $\frac{3}{4}$ turn? up
 - Which way was he facing after a full turn? left



2. Use these shapes to make patterns to show turns.



316 Turns squared paper

Using the Book Let the children experience the turn by following the activity in the display. Again, emphasize that neither size nor shape changes in a turn.

To ensure that the turn centre remains in one place, you may wish to have the students secure the figure with a thumbtack or pin.

Use 2 cm squared paper from which to cut the figures. For each one, note the turn centre. If dot paper is used (as shown for Exercise 3), some students will need to cut out the shape to correctly locate the turn.

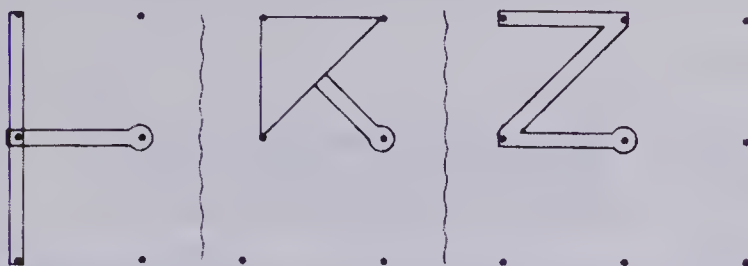
It is recommended that you work with the students while the turns are being completed. In Exercise 1(b) and (e), stress that the answers should relate to the direction the clown was facing in the starting position.

The students may enjoy colouring the patterns formed in Exercises 2 and 3.

For the Tune Up, assign the exercises. If students have unusual difficulty, provide appropriate remedial practice.

The table on the next page shows exactly where the skills are presented in the text.

3. Draw each pattern on dot paper as shown.
Then draw the shape after $\frac{1}{4}$ turn, $\frac{1}{2}$ turn, $\frac{3}{4}$ turn, full turn.



Tune Up

Multiply.

1. 35×10 2. 84×100 3. 97×1000 4. 40×50 5. 976×1

6. 26×9 7. 356×8 8. 63×35 9. 481×64 10. 608×7

Divide

11. $80 \div 10$ 12. $700 \div 100$ 13. $23\,000 \div 1000$ 14. $86\,000 \div 10$

15. $3 \overline{)72}$ 16. $6 \overline{)846}$ 17. $3 \overline{)296}$ 18. $9 \overline{)579}$ 19. $4 \overline{)438}$

Write as a decimal.

20. $\frac{6}{10}$ 21. $\frac{1}{2}$

Add.

22. $2.3 + 4.5$ 23. $5.9 + 8.7$

Subtract.

24. $9.8 - 3.5$ 25. $16.2 - 9.9$

4. For use with the Tune Up.

Challenge the students with an "Answer the Riddle" puzzle such as:

Perform the calculations for each word.
Use the code.

Why do cows wear cowbells?

Because _____

1st word 2nd word
 $12\,989$ 547
 $+ 8\,996$ $\times 32$

3rd word 4th word
 617 8500
 $\times 6$ $- 6794$

Code:

D	E	H	I	K	N	O	R	S	T
3	9	1	8	6	0	7	5	4	2

Exercise	Topic	Page
1-5	Multiplication by powers of 10	79-80
6	Multiplication of 2 digits by 1 digit	89
7, 10	Multiplication of 3 digits by 1 digit	91
8	Multiplication of 2 digits by 2 digits	252
9	Multiplication of 3 digits by 2 digits	256
11-14	Division by powers of 10	122
15	Division algorithm	117
16	Division, 3-digit quotient	259
17, 18	Division, 2-digit quotient with remainder	121
19	Division, 3-digit quotient with remainder	262
20	Fractions as decimals	132
21	Fractions as decimals	238
22, 23	Addition of decimals (tenths) with regrouping	148
24, 25	Subtraction of decimals (tenths) with regrouping	149

OBJECTIVE

To develop intuitively the concept of a flip

PACING

Level A All
Level B All
Level C All

MATERIALS

blocks, scissors, plastic mirrors (if available)

RELATED AIDS

HMS—DM78.

BACKGROUND

A flip is a mirror image or reflection of an object. Size and shape do not change because of a flip. The image in a flip is the mirror reversal of the object. In a flip, the object and the image form a symmetric pattern. The flip line is the line of symmetry.

SUGGESTIONS

Initial Activity Have the students lie down on the gym floor on their backs with one side along a line. Then have students turn over or flip over the line. Discuss the difference in position of the legs, arms, etc. in relation to the line.

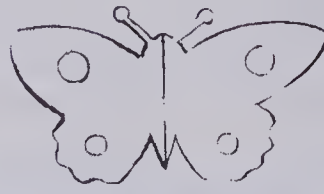
Use a transparent cutout and put a mark in one corner. Have the children flip the shape over a line. Discuss the position of the mark on the object after a flip.

ACTIVITIES

1. See "The Relation Game" as described in the Activity Reservoir.
2. Have the children find the letters of the alphabet and counting numbers that have a line of symmetry (i.e., so that when folded, one half matches the other half).
3. See DM78.

Flips

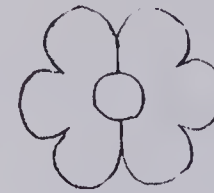
At the fair, Gladys and Romaine saw a man make these paper cutouts.



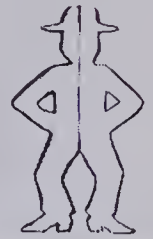
The Butterfly



The Hooknose Twins



The Flower



The Cowboy

Each half is a flip of the other half.

Exercises

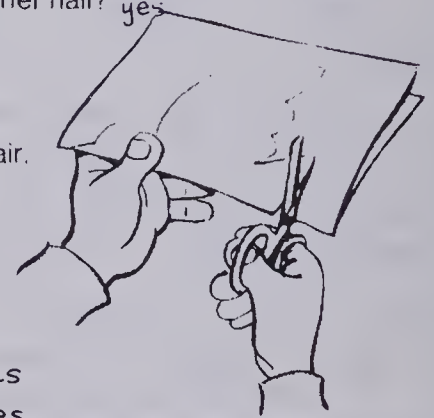
1. Is one half of each cutout the same shape as the other half? yes
2. Is one half of each cutout the same size as the other half? yes
3. Is one half facing the opposite direction to the other half? yes
4. How is one half different from the other half?
They face opposite directions.
5. Use paper to make a cutout like the man at the fair.
 - (a) Fold first.
 - (b) Hold the folded edge and cut a pattern.
 - (c) Open up

Cut some more *flip* patterns.

Does one half always match the other half?

Is there a fold line between the two halves?

yes
yes

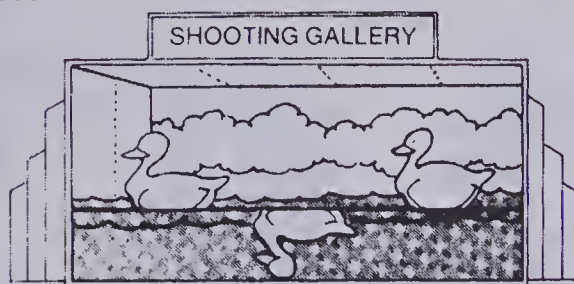


318 Flips, real objects

Using the Book Demonstrate what the display illustrates by making a large cutout. Show what the pattern looks like before and after the flip. Provide ample opportunity for the students to carry out the activities illustrated in the exercises. Ask the children to talk about what they see by asking the questions in the first four exercises. When cutting out a figure from a folded piece of paper, introduce the idea of symmetry. The fold line cuts the object into two identical pieces.

If plastic mirrors are not available, have the children trace each pair of figures and then fold the paper to see if the pictures are flips of one another, that is, do the pictures match one another when the paper is folded.

6. Gladys and Romaine went past the shooting gallery again. One duck had been hit.

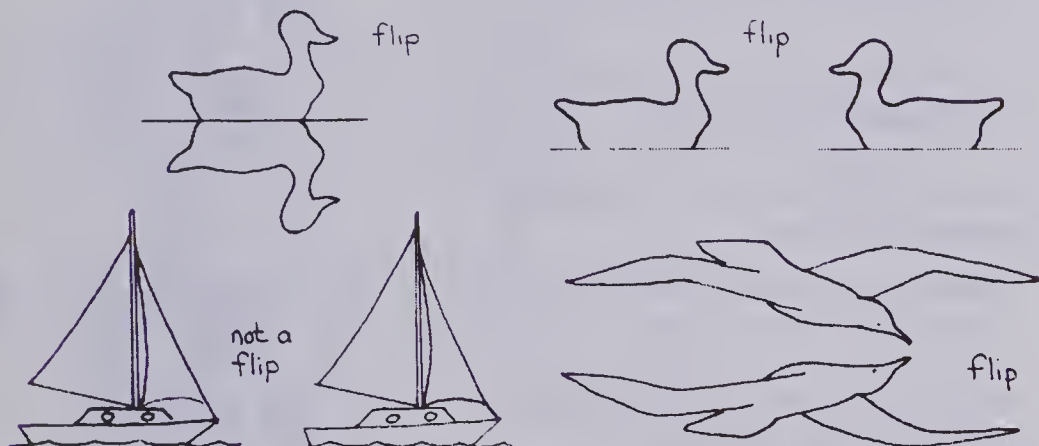


The duck has *flipped*.

Trace each duck and draw it *flipped* over the line.



7. Romaine uses a plastic mirror at school to decide which are *flips*. Which are *flips*? Explain.



Flips: real objects 319

4. Provide the students with simple shapes (geometric figures, planes, flowers, the attached letters of their initials, etc.) from which they can make cardboard templates. Have them make patterns using slides, turns, and flips of their shape.

5. Look for patterns in nature. Bring to class an apple, banana, onion, orange, pear, carrot, potato, etc. Working with the class, cut the items in different ways to get different patterns. Discuss symmetry, number of sides (where applicable), concentric rings (as in onion), etc.

OBJECTIVE

To draw shapes on squared paper and dot paper to illustrate flips

PACING

Level A 1-6
Level B 1-6
Level C All

MATERIALS

tracing paper, 1 cm grid paper

RELATED AIDS

HMS—DM76.

SUGGESTIONS

Initial Activity Remind students that the size and shape of an object do not change in a flip. Also, note that there is always a line over which the object is flipped (line of symmetry or flip line).

ACTIVITIES

1. Have students locate the flip line in a multiplication table or fill in a multiplication table using a flip line. (Do not have students flip the numbers.) This will emphasize the commutative property of multiplication.

2. Ask students to find numbers which can be flipped and still read the same.

Example

1881

(Make the 1 and 8 carefully.)

3. Ask students to repeat Activity 2 for rotations (e.g., 1691).

4. See "Regatta" as described in the Activity Reservoir.

More Flips

Gladys used cutouts to draw flip patterns.



Later — the
Alligator

Exercises

Trace and cut out *Later — The Alligator*.

1. Place him on squared paper. Trace. Which way is he facing? left
2. Flip him over the line at his tail. Trace. Which way is he facing? right
3. Flip him over the line at his nose. Trace. Which way is he facing? left

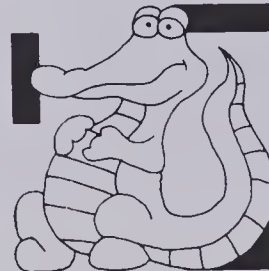
Place *Later — The Alligator* on a new sheet of squared paper. Trace.

4. Flip him over the line at his feet. Trace. Is he upside down now? yes
5. Flip him over the line at his head. Trace. Is he right side up now? yes



320 Flips, squared paper

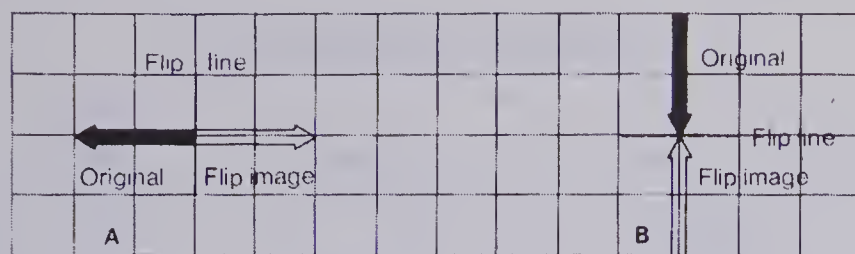
Using the Book When cutting out the pattern of *Later-The-Alligator*, it is best to leave a bit of each vertical and horizontal line over which he can be flipped. These bits help the student align *Later* properly in the squares on the squared paper (DM76).



In Exercise 7, if a plastic mirror is not available, the student may have to cut out the shape and trace it after flipping. Some students may be able to locate points of corresponding parts and then join the points. This can be done by picking a point, finding its distance from the flip line, and then finding a distance from the flip line that is equal to the given distance but on the other side of the flip line.

In Exercise 8, some students will have to trace and cut out Figure A and then flip it to find the image.

6.



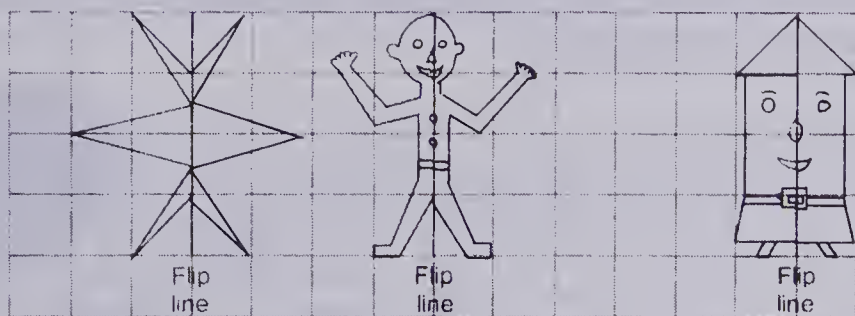
When we *flip* a shape over a line, there are three names that are important.

Original
The figure you start with.
What does each mean?

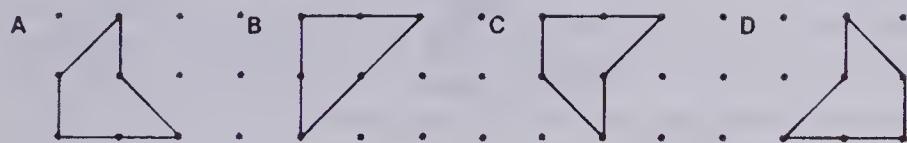
Flip line
The line used to flip
your original.

Flip image
The figure obtained
after the flip.

7. Draw each shape on squared paper.
Then draw the other half of each *flip* pattern.
Use a plastic mirror to check.



- Which figure is the flip of A? C and D.



Challenge

What happens to a cat when it drinks
lemonade?

$32.3 \times 10 = x$: subtract 241
 $998 \times 8 = x$: add 21 487
 $99 \times 10 = x$: add 7730
 $896 \div 8 = x$: subtract 106
 $889 \div 7 = x$: add 967
 $765 \div 9 = x$: add 3826

Code:

A	I	N	O	P	R	S	T	U
6	8	7	0	3	4	1	2	9

OBJECTIVES

To prepare for the introduction of the concept of the coordinate plane
To identify and locate points on a map using avenue and street intersections

PACING

Level A All
Level B All
Level C All

SUGGESTIONS

Initial Activity See the "Career Awareness" notes in the Chapter Overview (page 304). Discuss the nature of the work of a city designer, perhaps listing all the different items a city designer would need to consider when drawing a plan. Prepare a simple map of the community around the school. Identify and discuss the various points of interest (locations of students' houses or apartment buildings, the school, friends' houses, parks, stores, etc.) and the possible routes from one location to another.

ACTIVITIES

1. Provide the students with individual maps (as in the Initial Activity) but with streets and roads only. Have them complete the details from the demonstration map onto their own personal copy.

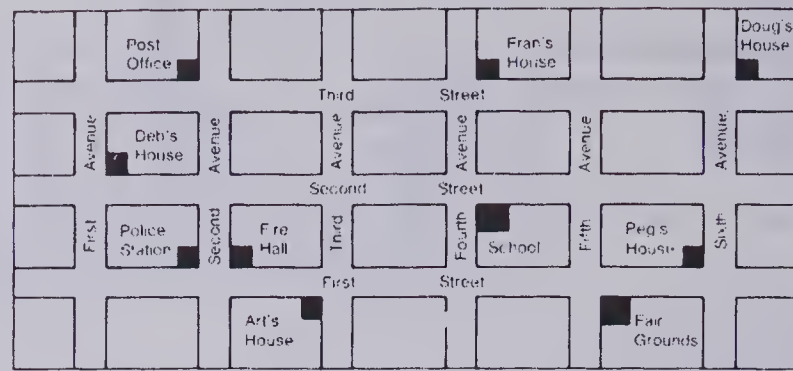
2. Prepare a large map of a city similar to that shown at the top of the page but with enough streets to accommodate a location for all class members. Have the students (a) place their name at an intersection somewhere on the map and (b) write their location (i.e., 3rd Avenue, 5th Street) on a card for the "mystery box". Select a card and read aloud the location. Have the group identify the "resident" of that location.

EXTRA PRACTICE

Use the map shown in the display.

1. Give two ways that Peg could go to school.
2. A car accident occurred at Sixth Avenue and Second Street. How far is this from the Police Station?
3. A truck hit a car at Third Avenue and Second Street. How far is this from the Police Station?
4. Doug's house was on fire. What is the shortest route from the Fire Hall to the fire.

City Designer



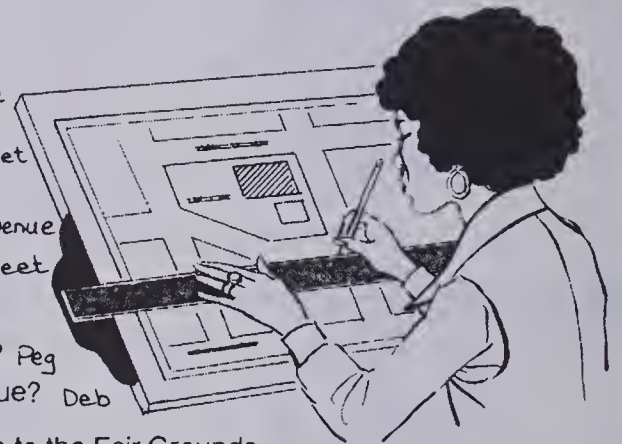
Art's house is on Third Avenue and First Street.

He walks two blocks to school.

He can walk 1 block on First Street, then 1 block on Fourth Avenue or 1 block on Third Avenue, then 1 block on Second Street.

Exercises

1. Find the Fair Grounds.
(a) On which avenue is it? Fifth Avenue
(b) On which street is it? First Street
2. Locate Doug's house.
(a) On which avenue is it? Sixth Avenue
(b) On which street is it? Third Street
3. Who lives on
(a) Sixth Avenue and First Street? Peg
(b) Second Street and First Avenue? Deb
4. Name two ways that Deb could go to the Fair Grounds.



322 City map

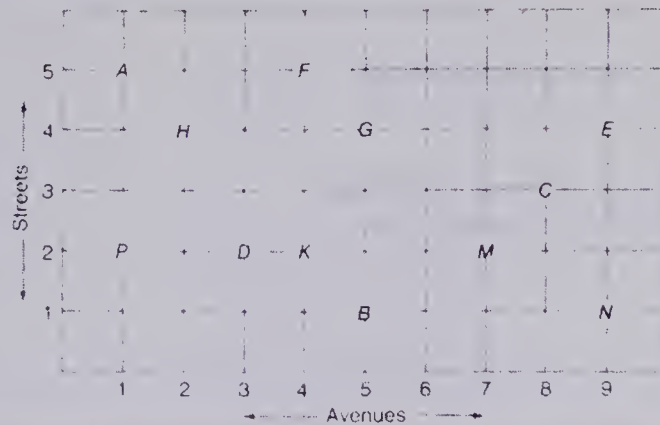
Using the Book Discuss the city map shown in the display. Get the students acquainted with the numbering of the avenues and streets by discussing the different routes it is possible to take to different places in town: the School, the Post Office, etc.

ANSWERS

4. 1 block on First Avenue, then 4 blocks on First Street or 4 blocks on Second Street, then 1 block on Fifth Avenue.
5. Who lives the closest to the:
(a) Fire Hall?
(b) Post Office?
(c) Fair Grounds?

Streets and Avenues

John drew a map of his town.
He said, "I live at 1st and 5th."
Harriett said, "I live at 8th and 3rd."



John uses this rule: Name the avenue first, then the street.

Exercises

Use John's rule

- What letter indicates where John lives? A
- How would you describe point B? 5th and 1st
3. What letter indicates where Harriett lives? C
4. Where is point F? 4th and 5th
Where is point G? 5th and 4th
How are points G and F different? Their positions are different.
5. The address of point H is 2nd Avenue and 4th Street.
We can write this (2nd, 4th) using John's rule.
Give the address of these points in (■, ■) form.
(a) M (7th, 2nd) (b) N (9th, 1st) (c) P (1st, 2nd)

BRAINTICKLER

In a rectangular room, how do you place 8 chairs along the walls so that there are an equal number of chairs along each wall? 2 on each wall

OBJECTIVE

To identify and locate points on a map using avenue and street intersections

PACING

Level A All
Level B All
Level C All

RELATED AIDS

HMS—DM77.

BACKGROUND

The conventional way of identifying a point on the coordinate plane is to give the x value first (distance right or left) and then the y value (distance up or down). This is strictly arbitrary but we will use the convention and have John name the avenue first, then the street.

ACTIVITIES

1. Prepare a worksheet that has students locate points on a map. Tell the story that John has gone for a walk. To find where he ends up, join the points in the order in which he passed them. The completed path should be a simple picture of a house, library, store, garage, etc.

Example

Mark these points and join them on an 8×8 map of a city of the sort shown on page 323.

(3rd, 1st), (3rd, 3rd), (2nd, 3rd), (2nd, 1st), (1st, 1st), (1st, 4th), (3rd, 8th), (4th, 6th), (7th, 6th), (8th, 4th), (8th, 1st), (3rd, 1st).

2. Provide the children with 2 cm graph paper (DM77). Have them draw simple shapes and "describe" their art by listing its intersection points as shown in Exercise 5.

3. Modify Activity 2 from page 322 to accommodate using coordinates to describe an intersection on a map.

EXTRA PRACTICE

1. Refer to the display. If John did not use the rule, give the letters of the two places John might live?
2. If Harriett did not use the rule, can you locate on the map the two places she might live? Explain.
3. Why is it important to agree on the rule when we just say "Harry lives at 5th and 4th."?

Using the Book Show that if a convention (or common rule) is not followed, the point 4th and 3rd could be either one of two places.

In Exercise 1, emphasize that without John's rule, we do not know which of two places John lives. Also, point out that we are now identifying the *intersection* of the streets and avenues.

OBJECTIVES

To introduce ordered pair notation for writing coordinates
To locate and to identify points on a grid using ordered pairs

PACING

- Level A All
- Level B All
- Level C All

MATERIALS

10 × 10 grid paper (1 cm or use DM79), overhead projector

RELATED AIDS

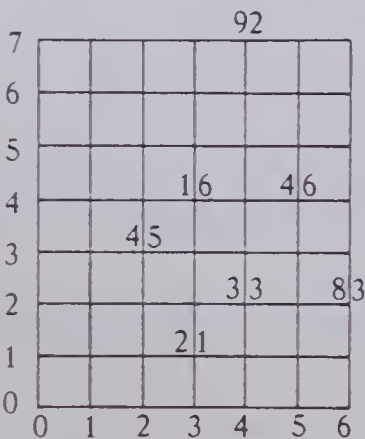
HMS—DM79.

SUGGESTIONS

Initial Activity Introduce the ordered pair notation (over 3, up 5) and have the students locate classroom desks, ceiling tiles, etc. using this notation. If students have done some avenue and street graphing (pages 322 and 323), have them locate the points using this notation (over __, up __).

ACTIVITIES

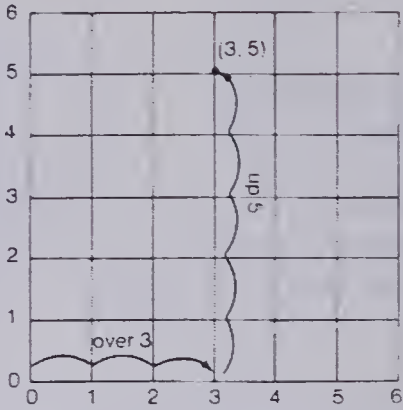
1. Students may enjoy playing a game which will provide practice in locating points on a graph. Give each student a map indicating streets and avenues. Students play in pairs. Each student "hides" five toys at various locations on their map. Player 1 indicates a point (second avenue, first street). If Player 2 has placed a toy at that point on the map, Player 1 gets it. Then Player 2 guesses. 10 guesses make a game. The winner is the one collecting the most toys.
2. Modify the game in Activity 1 by using a plain grid and ordered pairs. In place of toys we use spaceships and have a "space war".
3. Reinforce locating points on a grid and basic computational skills by preparing a grid as shown and a regular die. Have each player take turns



Using Grids

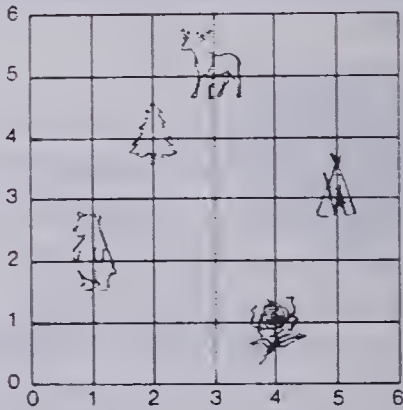
Find the point named by (3, 5).

First, move over 3 units.
Second, move up 5 units.



Exercises

1. The rose is located by (over 4, up 1).
2. The fir tree is located by (over 2, up 4).
3. What is located by (over 5, up 3)? tepee
4. As a shortcut, we leave out the words "over" and "up".
What is located by (3, 5)? deer
5. Where is the bear? (1, 2)



324 Plotting points, ordered pairs

Using the Book Locate the point (3, 5) indicated on the display grid. Emphasize that we mean over 3 and up 5 although the words over and up are not used. Note also that brackets are used to indicate the ordered pair, so named because the order of writing the numerals is very important.

You may wish to have a transparency of a grid for the overhead projector. This will aid in the illustration of various aspects of graphing. You can then do Exercise 7 as a group activity.

6. Mike and George hiked all day.
They were:
- | | | | | |
|--------|--------|--------|--------|--------|
| T | I | R | E | D |
| (1, 5) | (5, 3) | (2, 0) | (1, 4) | (1, 1) |
| A | N | D | | |
| (0, 2) | (3, 2) | (1, 1) | | |
| W | E | A | R | Y |
| (3, 4) | (1, 4) | (2, 3) | (4, 6) | (6, 4) |
- Copy and read the message.

Use a 6 × 6 grid for Question 7.

7. Locate these points.

(over 1, up 1)
(over 1, up 5)
(over 3, up 1)
(over 5, up 5)
(over 5, up 1)

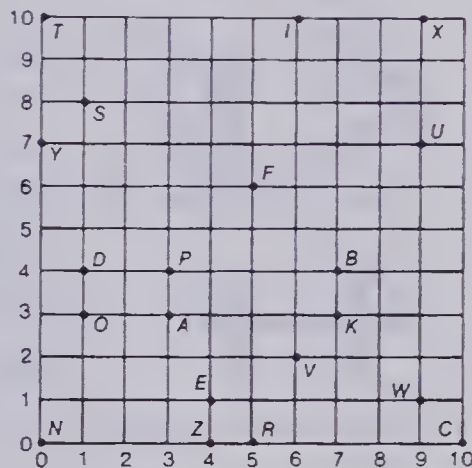
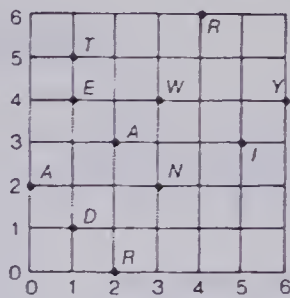
Join the points in order.
What letter do you get? M

8. Write the ordered pairs for each point.

(a) R (5, 0) (b) S (1, 8) (c) T (0, 10)
(d) U (9, 7) (e) V (6, 2) (f) W (9, 1)
(g) X (9, 10) (h) Y (0, 7) (i) Z (4, 0)
(j) A (3, 3) (k) B (7, 4) (l) C (10, 0)
(m) D (1, 4) (n) E (4, 1) (o) F (5, 6)

9. What do cats strive for?

P U R R F E C T I O N
(3, 4) (9, 7) (5, 0) (5, 0) (5, 6) (4, 1) (10, 0) (0, 10) (6, 10) (1, 3) (0, 0)



rolling the die twice to determine an ordered pair and writing down the number at that point. Players should have a cumulative total of their score. Player with the highest (or lowest, or closest to 100, etc.) score after 5 turns is the winner. A point on the grid where no number shows means "zero" for that roll.

Variations.

Use the grid shown to subtract from a starting score, e.g., 150. Player with the lowest score after 3 rolls wins, etc.

Instead of whole numbers, use fractions, decimals, number expressions (i.e., $56 \div 7$), or a combination of these.

EXTRA PRACTICE

Make and label a grid as shown. Locate these points. Join them in order:

Start: (0, 8). (2, 0). (4, 6). (6, 0). (8, 8).

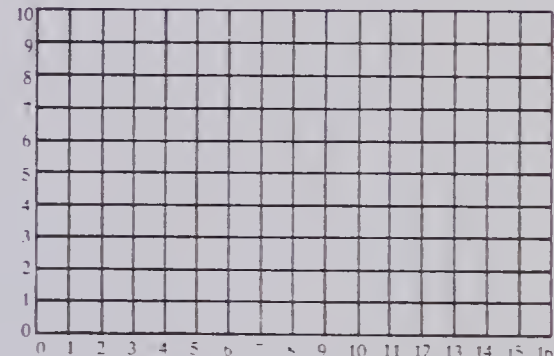
Stop.

Start: (8, 4). (8, 0). (8, 2). (10, 2). (10, 4). (10, 0). Stop.

Start: (12, 4). (14, 2). (14, 0). (14, 2).

(16, 4). Stop.

What word do you get?



OBJECTIVE

To evaluate achievement of the chapter objectives

PACING

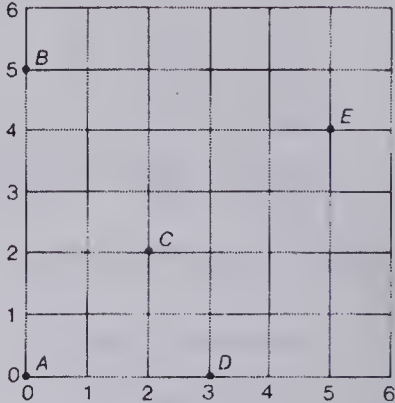
- Level A All
- Level B All
- Level C All

RELATED AIDS

HMS—DM80.

Chapter Test

- 1. Use a 10 × 10 grid. Locate these points. Label.
(10, 5) (6, 8) (1, 2) (3, 0) (0, 7)
- 2. Name the ordered pairs.
A (0,0) B (0,5) C (2,2) D (3,0) E (5,4)

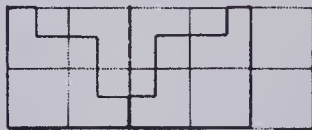


- 3. Draw each shape to show the following.

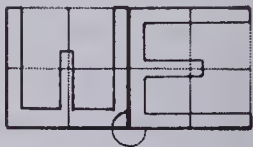
(a) Slide



(b) Flip



(c) 1/4 turn



- 4. Name each as a slide, turn, or flip.

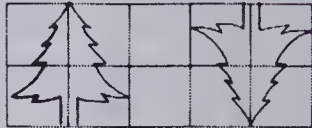
(a) flip



(b) slide



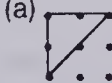
(c) turn



- 5. Which lines are parallel? (b)



- 6. Which triangles are congruent? (a) and (d)



Using the Book Each student should do this test independently under supervision. Assistance should be given only when the instructions are not understood. After the work has been corrected, you should provide appropriate remedial work. You may wish to reteach if a number of students had difficulty with a particular topic or concept.

The following chart will help in this regard. The specific objectives are listed in the Chapter Overview (see page 304).

An alternate Chapter Test can be found in the Holt Mathematics System Duplicating Masters available for use with this grade level.

Test Item	Objective	Text Page Number
1, 2	D	324
3, 4	C	312-321
5	A	306
6	B	310

Cumulative Review

1. Multiply.

$$\begin{array}{r} (a) \quad 50 \\ \times 9 \\ \hline 450 \end{array} \quad \begin{array}{r} (b) \quad 500 \\ \times 3 \\ \hline 1500 \end{array} \quad \begin{array}{r} (c) \quad 196 \\ \times 6 \\ \hline 1176 \end{array}$$

2. Divide. 30

$$\begin{array}{r} (a) \quad 7 \overline{)210} \\ (b) \quad 9 \overline{)819} \end{array}$$

$$(c) \quad 300 \div 10 = \blacksquare 30$$

3. What number is halfway between:

(a) 100 and 200? 150 (b) 150 and 200? 175 (c) 500 and 1000? 750

4. Add.

$$\begin{array}{r} (a) \quad 0.3 \\ + 2.5 \\ \hline 2.8 \end{array} \quad \begin{array}{r} (b) \quad 28.7 \\ + 12.8 \\ \hline 41.5 \end{array} \quad \begin{array}{r} (c) \quad 6014 \\ 149 \\ + 3612 \\ + 56 \\ \hline 9831 \end{array} \quad \begin{array}{r} (d) \quad \$7.04 \\ 1.65 \\ + 2.13 \\ \hline \$11.37 \end{array} \quad \begin{array}{r} (e) \quad \$11.47 \\ 6.71 \\ + 19.05 \\ + 23.63 \\ \hline \$60.86 \end{array}$$

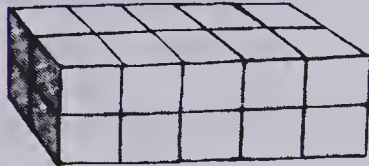
5. Subtract.

$$\begin{array}{r} (a) \quad 1.4 \\ - 0.3 \\ \hline 1.1 \end{array} \quad \begin{array}{r} (b) \quad 14.0 \\ - 6.8 \\ \hline 7.2 \end{array} \quad \begin{array}{r} (c) \quad 832 \\ - 675 \\ \hline 157 \end{array} \quad \begin{array}{r} (d) \quad \$7.65 \\ - 4.82 \\ \hline \$2.83 \end{array} \quad \begin{array}{r} (e) \quad \$26.44 \\ - 17.86 \\ \hline \$8.58 \end{array}$$

6. Name the shape.



7. What is the volume?
20 cubic units



8. Sandra bought a milkshake for 85¢ and a hot dog for 55¢.
She paid with a \$2 bill.
What change should she get back? \$0.60

OBJECTIVE

To review and test selected concepts and skills previously covered

PACING

Level A All
Level B All
Level C All

RELATED AIDS

CALC. W/BK — 30.

Chapters 1-11 cumulative review 327

Using the Book This page may be used for diagnostic and remedial as well as review purposes. Students should check their work, correct any errors, and review the pages that contain any problems of the type they missed. Some students can do this on their own while others may need help. If a number of students have a particular problem incorrect, you may want to reteach that topic to the groups, then assign a duplicated worksheet to reinforce that topic, or refer to the appropriate skill card in the BFA Computational Skills Kit II or BFA Problem Solving Kit II.

Test Item	Text Page Number
1 (a), 1 (b)	83
1(c)	91
2(a)	115
2(b)	117
2(c)	107
3	286
4(a), 5(a)	147
4(b)	148
4(c)	41
4(d), 4(e)	154
5(b)	149
5(c)	24
5(d), 5(e)	155
6(a)	186
6(b)	189
6(c)	195
7	275
8	156

Skills Check Up — Chapters 1 to 5

Give the correct answer for each: (a), (b), (c), or (d).

1.
$$\begin{array}{r} 503\,948 \\ + 249\,822 \\ \hline \end{array}$$
 (c)

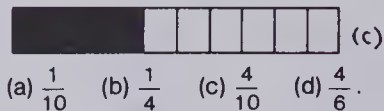
- (a) 753 870 (b) 742 760
(c) 753 770 (d) 853 870

2.
$$\begin{array}{r} 360\,454 \\ - 58\,960 \\ \hline \end{array}$$
 (b)

- (a) 312 594 (b) 301 494
(c) 311 494 (d) 312 394

3. The numeral for five thousand, three hundred four is: (b)
(a) 5034 (b) 5304 (c) 5340 (d) 534.

4. The fraction for the coloured part is:



5.
$$\begin{array}{r} 4.1 \\ + 6.9 \\ \hline \end{array}$$
 (a)

- (a) 11.0 (b) 10.1
(c) 10.1 (d) 101

6.
$$\begin{array}{r} \$16.54 \\ - 9.78 \\ \hline \end{array}$$
 (d)

- (a) \$7.76 (b) \$6.86
(c) \$7.86 (d) \$6.76

7. 8×9 (a) 56 (b) 64
(c) 72 (d) 81

8.
$$\begin{array}{r} 259 \\ \times 7 \\ \hline \end{array}$$
 (b)

- (a) 1453 (b) 1813
(c) 266 (d) 252

9. $5 \overline{)265}$ (a) 43 (b) 413
(c) 51 (d) 53

10. $8 \overline{)370}$ (a) 42 R 4 (b) 46 R 2
(c) 48 R 4 (d) 46 R 4

11. Our numeral for LXXIX is: (a)
(a) 79 (b) 81 (c) 129 (d) 131.

12. There are 325 apples in each box.
There are 5 boxes.
How many apples altogether? (a)
(a) 65 (b) 330 (c) 605 (d) 1625

Skills Check Up — Chapters 6 to 11

Give the correct answer for each: (a), (b), (c), or (d).

1. Calculate the area in square units.



- (a) 8 (b) 9 (c) 18 (d) 20

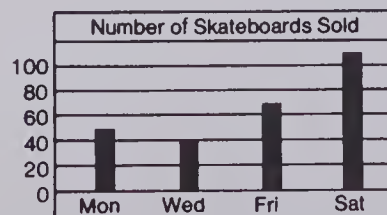
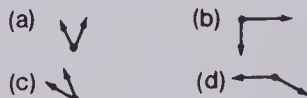
3.
$$\begin{array}{r} 600.03 \\ - 298.19 \\ \hline \end{array}$$
 (d)

5. This is an example of a



- (a) slide (b) turn (c) flip
(d) turn and flip.

7. Which is a right angle? (b)



2. Change to decimal form: $\frac{64}{100}$. (b)

- (a) 0.064 (b) 0.64 (c) 6.4 (d) 64

4. $\frac{9}{10} - \frac{3}{10}$ (a)

- (a) $\frac{6}{10}$ (b) $\frac{12}{10}$ (c) $\frac{1.2}{10}$ (d) $\frac{27}{100}$

6. Round 383.5 to the nearest hundred.

- (a) 300 (b) 384 (c) 380 (d) 400
(d)

8. A railway car is 14 m long.
There are 123 cars in the train.
How long is the train? (c)

- (a) 1522 (b) 1622
(c) 1722 (d) 1822

9. The number of skateboards sold on Friday was: (c)

- (a) 80 (b) 60
(c) 70 (d) 90.

Extra Practice — Chapter One

Add.

- | | | | | | |
|--|---|---|---|---|----|
| 1. (a) $\begin{array}{r} 45 \\ + 23 \\ \hline 68 \end{array}$ | (b) $\begin{array}{r} 65 \\ + 30 \\ \hline 95 \end{array}$ | (c) $\begin{array}{r} 27 \\ + 51 \\ \hline 78 \end{array}$ | (d) $\begin{array}{r} 32 \\ + 43 \\ \hline 75 \end{array}$ | (e) $\begin{array}{r} 50 \\ + 24 \\ \hline 74 \end{array}$ | 6 |
| 2. (a) $\begin{array}{r} 56 \\ + 28 \\ \hline 84 \end{array}$ | (b) $\begin{array}{r} 47 \\ + 35 \\ \hline 82 \end{array}$ | (c) $\begin{array}{r} 73 \\ + 18 \\ \hline 91 \end{array}$ | (d) $\begin{array}{r} 29 \\ + 36 \\ \hline 65 \end{array}$ | (e) $\begin{array}{r} 48 \\ + 18 \\ \hline 66 \end{array}$ | 7 |
| 3. (a) $\begin{array}{r} 325 \\ + 214 \\ \hline 539 \end{array}$ | (b) $\begin{array}{r} 503 \\ + 162 \\ \hline 665 \end{array}$ | (c) $\begin{array}{r} 420 \\ + 328 \\ \hline 748 \end{array}$ | (d) $\begin{array}{r} 608 \\ + 230 \\ \hline 838 \end{array}$ | (e) $\begin{array}{r} 563 \\ + 221 \\ \hline 784 \end{array}$ | 17 |
| 4. (a) $\begin{array}{r} 534 \\ + 267 \\ \hline 801 \end{array}$ | (b) $\begin{array}{r} 649 \\ + 282 \\ \hline 931 \end{array}$ | (c) $\begin{array}{r} 408 \\ + 297 \\ \hline 705 \end{array}$ | (d) $\begin{array}{r} 356 \\ + 357 \\ \hline 713 \end{array}$ | (e) $\begin{array}{r} 293 \\ + 397 \\ \hline 690 \end{array}$ | 19 |

Subtract.

- | | | | | | |
|--|---|---|---|---|----|
| 5. (a) $\begin{array}{r} 42 \\ - 27 \\ \hline 15 \end{array}$ | (b) $\begin{array}{r} 83 \\ - 39 \\ \hline 44 \end{array}$ | (c) $\begin{array}{r} 61 \\ - 25 \\ \hline 36 \end{array}$ | (d) $\begin{array}{r} 74 \\ - 19 \\ \hline 55 \end{array}$ | (e) $\begin{array}{r} 55 \\ - 26 \\ \hline 29 \end{array}$ | 22 |
| 6. (a) $\begin{array}{r} 547 \\ - 213 \\ \hline 334 \end{array}$ | (b) $\begin{array}{r} 683 \\ - 251 \\ \hline 432 \end{array}$ | (c) $\begin{array}{r} 427 \\ - 106 \\ \hline 321 \end{array}$ | (d) $\begin{array}{r} 866 \\ - 450 \\ \hline 416 \end{array}$ | (e) $\begin{array}{r} 798 \\ - 635 \\ \hline 163 \end{array}$ | 23 |
| 7. (a) $\begin{array}{r} 326 \\ - 159 \\ \hline 167 \end{array}$ | (b) $\begin{array}{r} 514 \\ - 267 \\ \hline 247 \end{array}$ | (c) $\begin{array}{r} 433 \\ - 178 \\ \hline 255 \end{array}$ | (d) $\begin{array}{r} 661 \\ - 294 \\ \hline 367 \end{array}$ | (e) $\begin{array}{r} 725 \\ - 337 \\ \hline 388 \end{array}$ | 24 |
| 8. (a) $\begin{array}{r} 640 \\ - 213 \\ \hline 427 \end{array}$ | (b) $\begin{array}{r} 407 \\ - 252 \\ \hline 155 \end{array}$ | (c) $\begin{array}{r} 580 \\ - 367 \\ \hline 213 \end{array}$ | (d) $\begin{array}{r} 704 \\ - 466 \\ \hline 238 \end{array}$ | (e) $\begin{array}{r} 501 \\ - 173 \\ \hline 328 \end{array}$ | 27 |
| 9. (a) $\begin{array}{r} 704 \\ - 336 \\ \hline 368 \end{array}$ | (b) $\begin{array}{r} 402 \\ - 257 \\ \hline 145 \end{array}$ | (c) $\begin{array}{r} 306 \\ - 149 \\ \hline 157 \end{array}$ | (d) $\begin{array}{r} 805 \\ - 428 \\ \hline 377 \end{array}$ | (e) $\begin{array}{r} 606 \\ - 359 \\ \hline 247 \end{array}$ | 28 |

330 Extra practice — chapter one

Extra Practice — Chapter Two

Give the meaning of each underlined digit.

1. (a) 2483 (b) 56 019 (c) 874 (d) 3570 (e) 178 644
 4 hundreds 5 ten thousands 4 ones 3 thousands 1 hundred thousands

Compare. Use $>$, $<$, or $=$.

2. (a) $219 \overset{<}{\bullet} 241$ (b) $3620 \overset{>}{\bullet} 3492$ (c) $553 \overset{>}{\bullet} 535$ (d) $6037 \overset{<}{\bullet} 6370$
 (e) $482 \overset{=}{\bullet} 482$ (f) $7219 \overset{<}{\bullet} 7291$ (g) $4926 \overset{>}{\bullet} 4629$ (h) $8818 \overset{<}{\bullet} 8881$

Add.

- | | | | | |
|--|--|---|---|----|
| 3. (a) $\begin{array}{r} 275 \\ + 187 \\ \hline 462 \end{array}$ | (b) $\begin{array}{r} 825 \\ + 497 \\ \hline 1322 \end{array}$ | (c) $\begin{array}{r} 4628 \\ + 2547 \\ \hline 7175 \end{array}$ | (d) $\begin{array}{r} 5073 \\ + 3689 \\ \hline 8762 \end{array}$ | 38 |
| 4. (a) $\begin{array}{r} 50487 \\ + 34861 \\ \hline 85348 \end{array}$ | (b) $\begin{array}{r} 26409 \\ + 31892 \\ \hline 58301 \end{array}$ | (c) $\begin{array}{r} 319785 \\ + 114036 \\ \hline 433821 \end{array}$ | (d) $\begin{array}{r} 143006 \\ + 219185 \\ \hline 362191 \end{array}$ | 39 |
| 5. (a) $\begin{array}{r} 240 \\ 3018 \\ + 2452 \\ \hline 5710 \end{array}$ | (b) $\begin{array}{r} 1703 \\ 1514 \\ + 2086 \\ \hline 5303 \end{array}$ | (c) $\begin{array}{r} 3442 \\ 617 \\ + 1579 \\ \hline 5638 \end{array}$ | (d) $\begin{array}{r} 4510 \\ 1632 \\ + 987 \\ \hline 7129 \end{array}$ | 41 |

Subtract.

- | | | | | |
|--|---|--|---|----|
| 6. (a) $\begin{array}{r} 5841 \\ - 3275 \\ \hline 2566 \end{array}$ | (b) $\begin{array}{r} 6307 \\ - 2414 \\ \hline 3893 \end{array}$ | (c) $\begin{array}{r} 4068 \\ - 1589 \\ \hline 2479 \end{array}$ | (d) $\begin{array}{r} 2044 \\ - 246 \\ \hline 1798 \end{array}$ | 42 |
| 7. (a) $\begin{array}{r} 37259 \\ - 19410 \\ \hline 17849 \end{array}$ | (b) $\begin{array}{r} 48071 \\ - 22518 \\ \hline 25553 \end{array}$ | (c) $\begin{array}{r} 329380 \\ - 110684 \\ \hline 218696 \end{array}$ | (d) $\begin{array}{r} 157721 \\ - 23952 \\ \hline 133769 \end{array}$ | 43 |

8. (a) Marina drew a line 4 m long. How many decimetres? How many centimetres?
 (b) Paul drew a line 3 dm long. How many centimetres? How many millimetres?

Extra practice — chapter two 331

ANSWERS

8. (a) 40 dm, 400 cm (b) 30 dm, 300 mm

Extra Practice — Chapter Three

Multiply.

1. (a) $6 \times 0 = 0$ (b) $1 \times 7 = 7$ (c) $0 \times 9 = 0$ (d) $4 \times 1 = 4$ (e) $1 \times 1 = 1$

64

Round to the nearest multiple of 10.

2. (a) 42 ₄₀ (b) 29 ₃₀ (c) 81 ₈₀ (d) 55 ₆₀ (e) 17 ₂₀ (f) 64 ₆₀

81

Round to the nearest multiple of 100.

3. (a) 224 ₂₀₀ (b) 450 ₅₀₀ (c) 313 ₃₀₀ (d) 105 ₁₀₀ (e) 666 ₇₀₀ (f) 542 ₅₀₀

92

Multiply.

4. (a) $1 \times 23 = 23$ (b) $35 \times 1000 = 35,000$ (c) $100 \times 42 = 4,200$ (d) $155 \times 10 = 1,550$ (e) $1000 \times 4 = 4,000$
 5. (a) $6 \times 40 = 240$ (b) $80 \times 3 = 240$ (c) $300 \times 2 = 600$ (d) $7 \times 500 = 3,500$ (e) $5 \times 90 = 450$

80

83

Estimate these products.

6. (a) $5 \times 37 \approx 200$ (b) $4 \times 29 \approx 120$ (c) $6 \times 48 \approx 300$ (d) $7 \times 52 \approx 350$ (e) $3 \times 88 \approx 270$

85

Multiply.

7. (a) $\begin{array}{r} 23 \\ \times 3 \\ \hline 69 \end{array}$ (b) $\begin{array}{r} 43 \\ \times 3 \\ \hline 129 \end{array}$ (c) $\begin{array}{r} 61 \\ \times 4 \\ \hline 244 \end{array}$ (d) $\begin{array}{r} 51 \\ \times 8 \\ \hline 408 \end{array}$ (e) $\begin{array}{r} 72 \\ \times 3 \\ \hline 216 \end{array}$
 8. (a) $\begin{array}{r} 28 \\ \times 6 \\ \hline 168 \end{array}$ (b) $\begin{array}{r} 73 \\ \times 4 \\ \hline 292 \end{array}$ (c) $\begin{array}{r} 52 \\ \times 7 \\ \hline 364 \end{array}$ (d) $\begin{array}{r} 34 \\ \times 5 \\ \hline 170 \end{array}$ (e) $\begin{array}{r} 32 \\ \times 8 \\ \hline 256 \end{array}$
 9. (a) $\begin{array}{r} 312 \\ \times 2 \\ \hline 624 \end{array}$ (b) $\begin{array}{r} 230 \\ \times 3 \\ \hline 690 \end{array}$ (c) $\begin{array}{r} 462 \\ \times 4 \\ \hline 1848 \end{array}$ (d) $\begin{array}{r} 316 \\ \times 5 \\ \hline 1580 \end{array}$ (e) $\begin{array}{r} 521 \\ \times 6 \\ \hline 3126 \end{array}$
 10. (a) $\begin{array}{r} 353 \\ \times 4 \\ \hline 1412 \end{array}$ (b) $\begin{array}{r} 232 \\ \times 8 \\ \hline 1856 \end{array}$ (c) $\begin{array}{r} 645 \\ \times 3 \\ \hline 1935 \end{array}$ (d) $\begin{array}{r} 247 \\ \times 6 \\ \hline 1482 \end{array}$ (e) $\begin{array}{r} 425 \\ \times 5 \\ \hline 2125 \end{array}$

87

89

94

95

Extra Practice — Chapter Four

Write a division sentence for each.

1. How many groups of:

- (a) 4 in 24? ₆ (b) 7 in 35? ₅ (c) 3 in 72? ₂₄ (d) 5 in 30? ₆ (e) 6 in 18? ₃
 $24 \div 4 = 6$ $35 \div 7 = 5$ $72 \div 3 = 24$ $30 \div 5 = 6$ $18 \div 6 = 3$

101

Divide.

2. (a) $16 \div 16 = 1$ (b) $24 \div 1 = 24$ (c) $7 \div 1 = 7$ (d) $35 \div 35 = 1$ (e) $1 \div 1 = 1$

106

3. (a) $30 \div 10 = 3$ (b) $700 \div 10 = 70$ (c) $6000 \div 100 = 60$ (d) $5000 \div 1000 = 5$

107

4. (a) $6 \overline{)27} \text{ } 4\text{R}3$ (b) $5 \overline{)22} \text{ } 4\text{R}2$ (c) $7 \overline{)50} \text{ } 7\text{R}1$ (d) $4 \overline{)30} \text{ } 7\text{R}2$ (e) $8 \overline{)49} \text{ } 6\text{R}1$

113

5. (a) $4 \overline{)42} \text{ } 10\text{R}2$ (b) $6 \overline{)51} \text{ } 8\text{R}3$ (c) $5 \overline{)37} \text{ } 7\text{R}2$ (d) $6 \overline{)57} \text{ } 9\text{R}3$ (e) $7 \overline{)62} \text{ } 8\text{R}6$

113

6. (a) $6 \overline{)240} \text{ } 40$ (b) $2 \overline{)600} \text{ } 300$ (c) $5 \overline{)3000} \text{ } 600$ (d) $7 \overline{)4200} \text{ } 600$ (e) $4 \overline{)160} \text{ } 40$

115

Estimate the quotient. Use multiples of 10.

7. (a) $4 \overline{)91} \approx 20$ (b) $2 \overline{)107} \approx 50$ (c) $7 \overline{)232} \approx 30$ (d) $5 \overline{)163} \approx 30$ (e) $6 \overline{)200} \approx 30$

116

Divide.

8. (a) $5 \overline{)125} \text{ } 25$ (b) $4 \overline{)164} \text{ } 41$ (c) $3 \overline{)84} \text{ } 28$ (d) $7 \overline{)175} \text{ } 25$ (e) $9 \overline{)378} \text{ } 42$

117

9. (a) $2 \overline{)229} \text{ } 114\text{R}1$ (b) $7 \overline{)255} \text{ } 36\text{R}3$ (c) $4 \overline{)295} \text{ } 73\text{R}3$ (d) $9 \overline{)668} \text{ } 74\text{R}2$ (e) $8 \overline{)507} \text{ } 63\text{R}3$

119

10. (a) $4 \overline{)176} \text{ } 44$ (b) $5 \overline{)304} \text{ } 60\text{R}4$ (c) $8 \overline{)499} \text{ } 62\text{R}3$ (d) $7 \overline{)483} \text{ } 69$ (e) $9 \overline{)541} \text{ } 60\text{R}1$

119

11. (a) $5 \overline{)189} \text{ } 37\text{R}4$ (b) $4 \overline{)145} \text{ } 36\text{R}1$ (c) $6 \overline{)357} \text{ } 59\text{R}3$ (d) $3 \overline{)140} \text{ } 46\text{R}2$ (e) $7 \overline{)226} \text{ } 32\text{R}2$

120

12. (a) $0 \div 2 = 0$ (b) No solution (c) $0 \times 10 = 0$ (d) $0 \div 26 = 0$ (e) $5 \times 0 = 0$

123

Extra Practice — Chapter Five

129

1. Write the fraction for the coloured part.



2. Write the decimal for the coloured part.



Add.

3. (a) $\begin{array}{r} 0.3 \\ + 0.6 \\ \hline 0.9 \end{array}$ (b) $\begin{array}{r} 0.6 \\ + 0.9 \\ \hline 1.5 \end{array}$ (c) $\begin{array}{r} 0.4 \\ + 0.8 \\ \hline 1.2 \end{array}$ (d) $\begin{array}{r} 1.6 \\ + 0.6 \\ \hline 2.2 \end{array}$ (e) $\begin{array}{r} 3.7 \\ + 2.2 \\ \hline 5.9 \end{array}$ (f) $\begin{array}{r} 5.8 \\ + 2.1 \\ \hline 7.9 \end{array}$ 142

4. (a) $\begin{array}{r} \$6.34 \\ + 2.52 \\ \hline \$8.86 \end{array}$ (b) $\begin{array}{r} \$44.14 \\ + 9.38 \\ \hline \$53.52 \end{array}$ (c) $\begin{array}{r} \$63.45 \\ + 2.98 \\ \hline \$66.43 \end{array}$ (d) $\begin{array}{r} \$30.04 \\ + 9.99 \\ \hline \$40.03 \end{array}$ (e) $\begin{array}{r} \$60.89 \\ + 8.98 \\ \hline \$69.87 \end{array}$

Subtract.

5. (a) $\begin{array}{r} 0.8 \\ - 0.3 \\ \hline 0.5 \end{array}$ (b) $\begin{array}{r} 0.9 \\ - 0.4 \\ \hline 0.5 \end{array}$ (c) $\begin{array}{r} 1.4 \\ - 0.7 \\ \hline 0.7 \end{array}$ (d) $\begin{array}{r} 1.9 \\ - 0.9 \\ \hline 1.0 \end{array}$ (e) $\begin{array}{r} 1.6 \\ - 0.9 \\ \hline 0.7 \end{array}$ (f) $\begin{array}{r} 1.4 \\ - 0.7 \\ \hline 0.7 \end{array}$ 144

6. (a) $\begin{array}{r} 4.6 \\ - 3.2 \\ \hline 1.4 \end{array}$ (b) $\begin{array}{r} 6.9 \\ - 2.7 \\ \hline 4.2 \end{array}$ (c) $\begin{array}{r} 7.3 \\ - 2.7 \\ \hline 4.6 \end{array}$ (d) $\begin{array}{r} 8.1 \\ - 3.6 \\ \hline 4.5 \end{array}$ (e) $\begin{array}{r} 3.8 \\ - 1.9 \\ \hline 1.9 \end{array}$ (f) $\begin{array}{r} 2.6 \\ - 0.9 \\ \hline 1.7 \end{array}$ 147

7. (a) $\begin{array}{r} \$5.86 \\ - 2.23 \\ \hline \$3.63 \end{array}$ (b) $\begin{array}{r} \$9.28 \\ - 3.83 \\ \hline \$5.45 \end{array}$ (c) $\begin{array}{r} \$17.84 \\ - 9.97 \\ \hline \$7.87 \end{array}$ (d) $\begin{array}{r} \$50.02 \\ - 13.28 \\ \hline \$36.74 \end{array}$ (e) $\begin{array}{r} \$38.32 \\ - 19.46 \\ \hline \$18.86 \end{array}$ 155

334 Extra practice — chapter five

Extra Practice — Chapters Six and Seven

1. A truck carries 8 cartons.
Each carton has a mass of 42 kg.
What is the total mass of all the cartons? 336 kg
2. The variety store has 42 chocolate bars, 56 packages of bubble gum, and 156 bottles of pop.
6 bottles of pop go in each carton.
How many cartons are needed? 26
3. One bag of fertilizer costs \$6.66.
A gardener bought two bags.
How much change would she get from a twenty-dollar bill? \$ 6.68
4. Two sides of a triangle are 6.4 cm and 3.2 cm long.
The perimeter is 15.4 cm.
What is the length of the third side? 5.8 cm

5. Copy and complete.

1 L = ☐ mL 1000

1 kg = ☐ g 1000

1000 g = ☐ kg 1

2 L = ☐ mL 2000

2 kg = ☐ g 2000

3000 g = ☐ kg 3

3 L = ☐ mL 3000

5 kg = ☐ g 5000

5000 g = ☐ kg 5

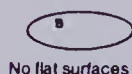
5 L = ☐ mL 5000

10 kg = ☐ g 10 000

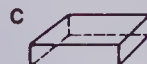
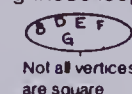
7000 g = ☐ kg 7

Refer to the shapes for Exercises 6 and 7.

6. Label two loops as shown.
Sort the shapes.



7. Repeat Exercise 6 using these loops.



Extra practice — chapters six and seven 335

Extra Practice — Chapters Eight and Nine

215

1. Write each as a decimal.

(a) $\frac{6}{10}$ (b) $\frac{25}{100}$ (c) $\frac{7}{100}$
 0.6 0.25 0.07

Add.

3. (a) $\begin{array}{r} 5.37 \\ + 4.29 \\ \hline 9.66 \end{array}$ (b) $\begin{array}{r} 10.45 \\ + 6.85 \\ \hline 17.30 \end{array}$ (c) $\begin{array}{r} 26.61 \\ + 12.89 \\ \hline 39.50 \end{array}$ (d) $\begin{array}{r} 345.20 \\ + 22.96 \\ \hline 368.16 \end{array}$ (e) $\begin{array}{r} 532.86 \\ + 403.78 \\ \hline 936.64 \end{array}$

Subtract.

4. (a) $\begin{array}{r} 9.54 \\ - 4.17 \\ \hline 5.37 \end{array}$ (b) $\begin{array}{r} 7.05 \\ - 2.86 \\ \hline 4.19 \end{array}$ (c) $\begin{array}{r} 24.21 \\ - 12.17 \\ \hline 12.04 \end{array}$ (d) $\begin{array}{r} 614.03 \\ - 51.28 \\ \hline 562.75 \end{array}$ (e) $\begin{array}{r} 323.14 \\ - 163.29 \\ \hline 159.85 \end{array}$

Find the missing addends.

5. (a) $24 + \square = 57$ (b) $\square + 12.5 = 18.7$ (c) $0.72 + \square = 3.15$
 33 6.2 2.43

Find the missing numbers.

6. (a) $4 \times n = 32$ (b) $n \times 5 = 35$ (c) $88 \div n = 11$ (d) $n \div 6 = 12$
 8 7 8 72

Multiply.

7. (a) $\begin{array}{r} 18 \\ 1.8 \times 10 \end{array}$ (b) $\begin{array}{r} 3 \\ 0.3 \times 10 \end{array}$ (c) $\begin{array}{r} 615 \\ 61.5 \times 10 \end{array}$ (d) $\begin{array}{r} 44 \\ 4.4 \times 10 \end{array}$
 8. (a) $\begin{array}{r} 46 \\ \times 23 \\ \hline 1058 \end{array}$ (b) $\begin{array}{r} 81 \\ \times 35 \\ \hline 2835 \end{array}$ (c) $\begin{array}{r} 614 \\ \times 13 \\ \hline 7982 \end{array}$ (d) $\begin{array}{r} 562 \\ \times 47 \\ \hline 26414 \end{array}$ (e) $\begin{array}{r} 298 \\ \times 47 \\ \hline 14006 \end{array}$

Divide.

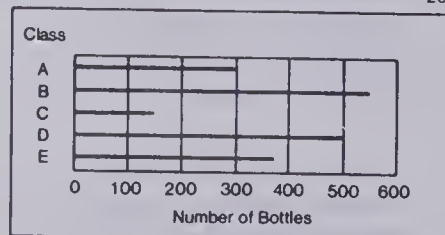
9. (a) $\begin{array}{r} 0.8 \\ 8 \div 10 \end{array}$ (b) $\begin{array}{r} 0.06 \\ 0.6 \div 10 \end{array}$ (c) $\begin{array}{r} 0.33 \\ 3.3 \div 10 \end{array}$ (d) $\begin{array}{r} 2.57 \\ 25.7 \div 10 \end{array}$
 10. (a) $\begin{array}{r} 37 \\ 4 \overline{)148} \end{array}$ (b) $\begin{array}{r} 35.82 \\ 5 \overline{)179.1} \end{array}$ (c) $\begin{array}{r} 245 \\ 3 \overline{)735} \end{array}$ (d) $\begin{array}{r} 241.82 \\ 6 \overline{)1450.92} \end{array}$ (e) $\begin{array}{r} 237 \\ 4 \overline{)948} \end{array}$

336 Extra practice — chapters eight and nine

Extra Practice — Chapters Ten and Eleven

290

- Which class collected the most bottles? the fewest? Class C
Class B
- Which class collected about twice as many as Class C? Class A
- About how many did class E collect? 375

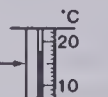


291

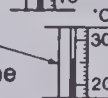
- Draw a line graph to show the number of ducks counted.

Mallards	3000	Teal	2500	Canvasback	1000
Pintails	1500	Goldeneye	500	Wood ducks	750

- Temperature at sunrise.

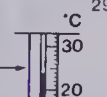


Temperature at noon.

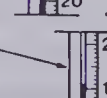


How many degrees did the temperature rise? 8°C

- Temperature at 15:00.



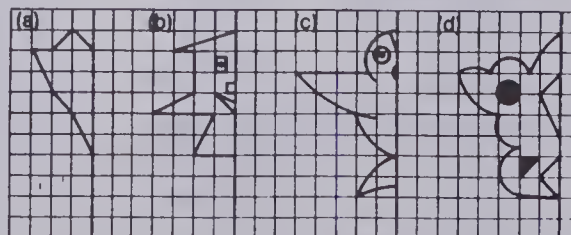
Temperature at 21:00.



How many degrees did the temperature drop? 13°C

314

- Trace or copy each shape on squared paper. Complete the other half of each.



Extra practice — chapters ten and eleven 337

INDEX

Addition

1-digit numbers, 5, 9, 13-15, 55 • 2-digit numbers, 6-7, 12, 20, 55 • 3-digit numbers, 17, 19-20, 30, 38, 44, 55 • 4-digit numbers, 38, 41, 44, 55 • 5-digit numbers, 39, 44, 55 • of decimals, 139-141, 148, 150, 220, 221 • of fractions, 236 • of money, 153-154, 156 • practice, 20, 30, 44, 55, 203, 213, 224, 231, 293, 297 • with 3 addends, 14 • with 4 addends, 15

Angle, 193, 308

Area

nonstandard units, 267 • square centimetres, 268-269 • square metres, 271

Associative property, 13, 82

Average, 164-165

Bar graphs, 281-289

Capacity, 173-174

Centimetres, 47-50, 52, 266 • and decimetres, 47, 136-137 • and millimetres, 49

Changing fractions to decimals, 238-239

Charts, 202

Checking division by multiplication, 118

Checking subtraction by addition, 26

Circle, 305

Circumference, 305

Commutative property, 12, 67-68

Cone, 195, 198-199

Congruent segments, 187, 309

Congruent shapes, 310-311

Construction of

angles, 308 • bar graphs, 284, 288 • circles, 305 • congruent shapes, 311 • flips, 318, 321 • line graphs, 290 • parallel lines, 306-307 • slides, 313 • turns, 314-315

Cross sections, 200

Cube, 185, 198-199

Cubic centimetres, 276

Cubic metre, 277

Cylinder, 194, 198-199

Decametres, 266

Decimal notation, 132-133, 215

Decimals, 132-157 • divided by 10, 251 • in addition, 139-142, 220-221 • in subtraction, 143-144, 222-223 • greater than 1, 135 • multiplied by 10, 250 • practice in adding, 142, 147-148, 150, 224, 293, 299 • practice in subtraction, 147, 149, 203, 224, 293, 297

Decimetres, 47-48, 50, 52, 136-140, 266

Denominator, 129

Differences

1- and 2-digit, 5, 21-22, 55 • 3-digit, 23-30, 55 • 4-digit, 42, 44, 55 • 5-digit, 43-44, 55 • of decimals, 143, 149, 222-223

Distributive property, 74-75, 86

Dividing by powers of 10, 107

Divisibility, 264

Division, 101-127, 245-279 • by 0, 123 • by 1, 106 • by 2, 3, 4, and 5, 104-105, 264 • by 6 and 7, 108 • by 8 and 9, 109 • by 10, 100, and 1000, 122 • of a decimal by 10, 251 • of powers of 10, 115 • practice, 110, 116-117, 119, 120-121, 125, 203, 245, 254, 262, 317 • quotients, 2-digit, 115-122, 258, 262 • quotients, 3-digit, 259-263

Division algorithm, 117

Estimating

area, 272 • capacity, 177 • length, 47-48, 177 • mass, 177 • numerical values, 84-85, 93, 114, 234, 255 • quotients, 114, 116 • time, 177

Even numbers, 72

Factors, 63, 246

Flips, 318-321

Four addends, 15, 20, 231

Fractions, 129 • addition of, 236, 239 • and decimals, 132-133, 135, 215, 238, 240 • comparison of, 131 • division, 241 • equivalent, 130, 134 • subtraction of, 237, 239

Grams, 175

Grids, 324-325

Grouping property for addition, 13

Grouping property for multiplication, 82

Hectometres, 266

Inequalities, 9, 35-36, 131, 146, 225-226, 230

Kilograms, 175

Kilometres, 51, 110, 266

Line graphs, 290-291

Litre, 173-174

Making change, 152, 157, 180

Maps, 168-169, 234, 322-323

Mass, 175

Measuring

length, 47-49, 136-137 • perimeter, 171 • area, 267-271 • volume, 274-277

Metres, 52, 138, 266 • and decimetres, 48, 138

Millilitres, 174

Millimetres, 49-50, 52, 266

Missing

addends, 227 • dividends, 247 • factors, 246 • information, 172

Money, 120-121, 151-156, 180-181, 201

Most appropriate units

of capacity, 176 • of length, 54 • of mass, 176

Multiple strips, 66

Multiples, 65-66 • of 10, 83

Multiplication, 61-97, 245-279 • by 0 and 1, 64 • by 6, 7, 8, 9, and 10, 77 • by 1, 10, 100, and 1000, 79-80 • of a decimal by 10, 250 • of 1-digit by multiples of 10, 83 • of 2-digits by 1-digit with regrouping, 89 • of 2-digits by 2-digits, 252-253 • of 3-digits by 1 digit, 91 • of 3-digits by 2-digits, 256-257 • practice, 78, 87, 94-96, 124, 203, 245, 254, 257, 265, 317 • three factors, 82

Multiplication and addition, 61-62, 74

Multiplication and division, 102-103

Multiplication table, 69, 76

Nets for

cone, 195 • cube, 185 • cylinder, 194 • prism, 190 • pyramid, 189 • rectangular prism, 186

Number line, 65, 81, 92, 142, 232

Number sentences, 9, 53, 67

Numerator, 129

Odd numbers, 72

Open number sentences, 9, 227

Order property of addition, 12

Order property of multiplication, 68

Ordinal numbers, 4

Palindromes, 46

Parallel lines, 306-307

Patterns

in division, 251 • in multiples, 65-66, 83 • in multiplication, 250

Perimeter, 171

Pictographs, 204-205, 207-209

Place value

hundred thousands, 39 • hundreds, 16, 24 • hundredths, 214-219 • ten thousands, 34 • tens and ones, 2-3 • tenths, 145 • thousands, 33-34

Place-value charts

in addition, 6-7, 17, 19, 38-39, 220 • in subtraction, 21-24, 27-29, 42

Plotting points, 324-325

Powers of 10, 79-80, 115, 122

Prism, 190

Problem solving method, 8, 10

Product, 61-63

Pyramid, 189, 192, 198-199

Quotient, 102

Ray, 308

Reading word problems, 8, 10

Rectangle, 188

Rectangular prism, 186, 192, 198

Regrouping, 18, 37 • in addition, 7, 19, 38, 39, 148, 154, 221 • in multiplication, 88-89, 94-95 • in subtraction, 22, 24, 27-29, 42-43, 149, 155, 223

Remainders, 112-113, 119-121

Right angle, 193, 308

Roman numerals, 56-57

Rounding to

nearest 10, 81, 233 • nearest 100, 92, 233 • nearest 1000, 233 • nearest centimetre, 166 • nearest millimetre, 166 • nearest whole, 232, 233

Scale drawings, 167-169

Seconds, 299

Skeleton models, 191

Slides, 312-313

Solid shapes, 185-192, 194-196

Sorting, 197

Sphere, 196, 198-199

Square, 188

Square centimetre, 268-269

Square metre, 271

Subtraction

1- and 2-digit numbers, 5, 9 • 2-digit numbers, 21-22, 55 • 3-digit numbers, 23-30, 55 • 4-digit numbers, 42, 44, 55 • 5-digit numbers, 43-44, 55 • of decimals, 143, 149, 222-223 • of fractions, 237 • of money, 154-157 • practice, 26, 30, 44, 55, 203, 213, 224, 293, 297

Sums

1- and 2-digit, 5 • 2-digit, 6-7, 12-15, 55 • 3-digit, 17, 19-20, 30, 38, 44, 55 • 4-digit, 38, 41, 44, 55 • 5-digit, 39, 44, 55 • of decimals, 139-141, 148, 150, 220-221

Tally charts, 206

Temperature, 292-295

Three addends, 13-14, 20, 41, 231

Tiles, 73, 270

Time, 298-301

Tri-wheels, 273

Triangle, 189, 309

Triangular prism, 192, 198-199

Turns, 314-317

Two-step problems, 180-181

Volume, 274-277

Word problems

addition, 6, 8, 10-11, 40, 45, 51, 53-54, 142, 161, 163, 179, 228 • and maps, 169, 322-323 • area, 270-271, 296 • bar graphs, 281-289 • based on paragraphs, 179 • capacity, 173 • decimals, 142, 144, 147, 221, 228, 235 • division, 107, 111-112, 122, 162-163, 248-249, 253, 261, 263 • inequalities, 36, 54, 146 • line graphs, 290-291 • measurement, 51, 53-54 • missing information, 172 • money, 152, 156-157, 201 • multiplication, 70, 79, 90, 97, 162-163, 249, 257, 263 • number sentences, 53, 228-229 • pictographs, 204-205, 207-208 • remainders, 112 • subtraction, 8, 11, 21, 23, 25, 45, 53-54, 144-147, 161, 163, 179, 228 • temperature, 292-295 • tiles, 270 • time and distance, 170 • time line, 301 • two-step, 180-181 • volume, 277, 296

Writing

decimals, 132, 135, 216-219 • fractions, 129 • whole numbers, 1-3, 16, 33-34

Zero, 27-29, 123

SEP 24 1991

QA 107 H78 1980 BK-4 TCH-ED- C-5
HOLT MATHEMATICS SYSTEM/

M2 39529861 CURR



000037673688

R

AUTHORIZATION
RECOMMENDED FOR USE
WITHDRAWN
IN ALBERTA SCHOOLS

Marshall P. Bye
Wendy E. Auger
Jean Bennie
Ronald S. Sauer
Neil Williamson



Holt, Rinehart and Winston of Canada, Limited

ISBN 0-03-920013-2